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## CONTENTS

No.	Article.	Subject.	Page.
1	I	Contributions to the Flora of Tropical America : XXV - - - - -	1
	II	Additions to the Flora of Cyprus : II - - - - -	16
	III	Contributions to the Flora of Borneo and other Malay Islands : V - - - - -	17
	IV	<i>Spartina Townsendii</i> and <i>S. brasiliensis</i> in Warm Countries - - - - -	21
	V	Contributions to the Flora of Siam. Additamentum XL - - - - -	34
	VI	<i>Achyrospermum</i> in Tropical Africa - - - - -	47
	VII	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew : XVII - - - - -	60
	VIII	The Anatomy of some Lauraceous Scent-yielding Woods known as " Medang " - - - - -	66
	IX	The Effects of the Frost of May 16th, 1935 - - - - -	72
	X	New or Noteworthy South African Plants : VIII - - - - -	80
	XI	The Dates of Hooker's Botanical Miscellany - - - - -	85
	XII	The Flora of the Pyrénées Orientales. New Varieties and Additions - - - - -	95
	XIII	On the Flora of the Nearer East : XVII - - - - -	100
	XIV	On the Systematic Position of the Genus <i>Dolianthus</i> - - - - -	103
	XV	Two New <i>Arundinarias</i> from Yunnan - - - - -	106
	XVI	Miscellaneous Notes - - - - -	107
2	XVII	Technical Terms in Ruellius' <i>Dioscorides</i> - - - - -	145
	XVIII	Principal Decisions concerning Nomenclature made by the Sixth International Botanical Congress - - - - -	185
	XIX	Miscellaneous Notes - - - - -	189
3	XX	A List of True and False Mahoganies - - - - -	193
	XXI	Contributions to the Flora of Tropical America : XXVI - - - - -	210
	XXII	African Orchids : VIII - - - - -	221
	XXIII	Second List of Fungi and Diseases of Economic Plants in Tanganyika Territory - - - - -	234
	XXIV	Miscellaneous Notes - - - - -	240
4	XXV	<i>Mundulea</i> Fish Poison - - - - -	245
	XXVI	The Bamboo Genera, <i>Dinochloa</i> and <i>Melocalamus</i> - - - - -	251
	XVII	<i>Eranthemum</i> of the " Flora of Tropical Africa " - - - - -	255
	XXVIII	New or Little-Known Plants from South India : VII - - - - -	274
	XXIX	Note on the Distribution of <i>Hyptis</i> in the Old World - - - - -	278
	XXX	Plants New to Assam : VIII - - - - -	280
	XXXI	Miscellaneous Notes - - - - -	286

No.	Article.	Subject.	Page.
5	XXXII	Notes on African Grasses : XIX - - -	293
	XXXIII	Miscellaneous Notes - - -	335
6	XXXIV	The Cultivation of Hydnocarpus Wightianus in Nigeria - - -	341
	XXXV	Contributions to the Flora of Tropical America : XXVII - - -	346
	XXXVI	Contributions to the Flora of Tropical America : XXVIII - - -	387
	XXXVII	Miscellaneous Notes - - -	392
7	XXXVIII	Preliminary List of Fungi and Diseases of Plants in Sierra Leone - - -	397
	XXXIX	List of Fungi collected in Sierra Leone - - -	424
	XL	A Note on the Himalayan Daphnes - - -	433
	XLI	Miscellaneous Notes - - -	441
8	XLII	Researches on <i>Silene maritima</i> and <i>S. vulgaris</i> : XVI - - -	445
	XLIII	Melanesian Plants : II - - -	459
	XLIV	Miscellaneous Notes - - -	466
9	XLV	Tropical African Plants : XIV - - -	469
	XLVI	Decades Kewenses : Decas CXXXII - - -	490
	XLVII	Notes on the Genus <i>Schima</i> and on the Classification of the Theaceae-Camellioideae - - -	496
	XLVIII	Notes on African Grasses : XX - - -	500
	XLIX	Miscellaneous Notes - - -	501
10	L	Sources of Vegetable Wax - - -	503
	LI	Notes on an Expedition to the Rupununi District British Guiana - - -	526
	LII	Miscellaneous Notes - - -	530
	Appendix	Review of the Work of the Royal Botanic Gardens, Kew, during 1936 - - -	

# BULLETIN OF MISCELLANEOUS INFORMATION No. 1, 1936 ROYAL BOTANIC GARDENS, KEW

## I—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXV\*.

### SPECIES NOVAE MEXICANAE HINTONIANAE.

The rich collections formed by Mr. G. B. Hinton in Mexico now exceed 8,000 numbers, mostly from the district of Temascaltepec, in the south-west part of Mexico State. Six of the novelties have already been figured in Hooker's *Icones Plantarum*, namely *Nissolia Hintoni* (t. 3248), *Platymiscium lasiocarpum* (t. 3249), *Cuphea Hintoni* (t. 3294), *Hintonia latiflora* var. *leiantha* (t. 3295), *Bouvardia capitata* (t. 3296) and *B. cataphyllaris* (t. 3297). The present paper includes descriptions of thirteen new species, five of which, belonging to the Gesneriaceae, are contributed by Mr. C. V. Morton of the United States National Herbarium.

### I. MISCELLANEOUS NEW SPECIES.

#### STERCULIACEAE (A. A. Bullock).

***Hyttneria atrata* Bullock**, sp. nov.; inter species mexicanas caulibus herbaceis, foliis longius petiolatis laminis basi profunde cordatis, floribus plus minusve terminaliter paniculatis distincta.

*Herba* erecta, perennis, 2-3 m. alta; caules virides, haud lignosi, simplices vel apicem versus (regione florifera) leviter ramosi, basi 5-8 mm. vel ultra crassi, prominenter 5-angulati, angulis subdistanter aculeatis, aculeis patentibus vel leviter recurvis circiter 1-1.5 mm. longis, ceterum glabri. *Folia* inferiora longe petiolata; petioli ascendentes, usque ad 6 cm. longi, angulati, aculeati, apice basique plus minusve pilosi ceterum glabri; lamina patens, triangulari-ovata, apice longe acuminata, basi profunde cordata, usque ad 12 cm. longa, et 8 cm. lata, subtus parcissime supra densius hirsuta, e basi 7 (5-11-) -nervia, nervis venisque minute vel obsolete aculeatis, marginibus grosse serrata vel crenato-serrata, dentibus mucronulatis et plus minusve ciliatis; folia superiora minora, sursum in bracteis abeuntia; petioli vix distincti usque ad 1 cm. longi; lamina ovata usque anguste lanceolata, basi truncato-subcordata, ceterum ut in foliis inferioribus. *Inflorescentiae* terminales et laterales, paniculatae; flores graciliter pedicellati, in cymis umbelliformibus paucifloris ex axillis foliorum superiorum vel bractearum foliacearum ortis dispositi; pedicelli vulgo 3-4 mm. sed usque ad 8 mm.

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\*Continued from K.B. 1935, 316.

longi, basi bracteolati, bracteolis triangularibus usque ad 2.5 mm. longis sed saepissime minoribus. *Sepala* 5, oblongo-ovata, apice subacuta, 4.5-6 mm. longa, 2-3 mm. lata, utrinque glabra. *Petala* 5, in toto usque ad 4 mm. longa; unguis membranaceus, basi leviter dilatatus, usque ad 1 mm. longus; lamina erecta, carnosa, sub-orbicularis, usque ad 1 mm. diametro, apice plus minusve acuta usque rotundata, incurvata, utrinque margine glandula nectarifera brevissime stipitata instructa; appendix carnosa, dorsaliter affixa, anguste lingulato-ovoidea, breviter stipitata, usque ad 2.5 mm. longa, 0.6 mm. lata. *Staminum* *tubus* membranaceus, cupularis, 1 mm. longus, apice 5-fidus, lobis 0.5 mm. longis rectangularibus glandula carnosa apiculato-excurrente terminatis; antherae parvae subsessiles, sinibus loborum insertae, extrorse dehiscentes. *Ovarium* subglobosum, circiter 0.5 mm. diametro, glabrum, leviter rugosum; stylus subulatus 0.5 mm. longus. *Capsula* globosa dense carnosa echinata, in toto 1.5 cm. diametro, echinis conico-subulatis circiter 3-5 mm. longis. *Semina* elongato-reniformia, circiter 7 mm. longa, laevia, brunnea.

MEXICO. State of Mexico: District of Temascaltepec; Timbres, 1900 m., fl. 4 Aug. 1932, *Hinton* 1242; Cerro Muñeca, 2300 m., "3 m. high, flower black," fl. 18 Aug. 1932, *Hinton* 1378; Tule, 1800 m., "2 m. high," fl. and fr. 21 Sept. 1933, *Hinton* 4664; Teju-pilco, 1340 m., fl. and fr. 27 Sept. 1933, *Hinton* 4830 (type).

*Byttneria atrata* is a strictly herbaceous perennial, attaining nine or ten feet in height. The flowers are almost black, and are borne in pedunculate umbelliform cymes in the axils of the upper leaves or leaf-like bracts. The lower leaves are long-petiolate, and deeply cordate at the base, this character being sufficient to distinguish it from its nearest Mexican ally, *B. aculeata* (Jacq.) Jacq. which is a woody climber bearing its flowers in the axils of all the leaves on the young stems. The fruits also afford a diagnostic character in their fleshy, conical spines, as contrasted with the filiform indurated spines of *B. aculeata*.

#### LEGUMINOSAE (N. Y. Sandwith).

*Dalea Hintoni* Sandwith sp. nov.; ut videtur subgen. *Euparoselae*, sect. *Formosarum*, forsan *Paroselae Saffordii* Rose affinis, stipulis minutis, inflorescentiis distincte pedunculatis densissime congestifloris ac albo-lanatis, forma bractearum, petalis carinae minoribus valde distincta; a *P. Hemsleyana* Rose (sect. *Tuberculatarum*) ramulis haud glanduloso-tuberculatis, pedunculis brevibus statim distinguitur.

*Suffrutex* humilis, 15-30 cm. alta, e radice subterranea crassa lignosa longe ramosa (forsan sobolifera?) caules annotinos intricate ramosos graciles ut videtur basi saltem plus minusve procumbentes emittens; rami hornotini multi, gracillimi, flexuosi, glabri, etuberculati, inferne rubro-purpurei; internodia saepius 3-10 mm. longa. *Stipulae* minutae, caducae, triangulari-subulatae, circiter 0.5 mm.

longae. *Folia* glabra, rhachi foliolisque subtus conspicue glanduloso-punctatis, brevia, 0·8–1·6 cm. longa; rhachis alata; foliola 3–9-juga, crassa, subcarnosa, juniora supra plus minusve concava, supra viridia vel purpurascentia, subtus glaucescentia, spathulato-oblonga, apice rotundata, nonnunquam retusa vel crenata, costa subtus conspicua, ceterum enervia, 2–4·5 mm. longa, 0·75–1·75 mm. lata; petioluli ad 0·5 mm. longi. *Inflorescentiae* globoso-capitatae, pedunculis glabris 0·8–2 cm. longis, maturae petalis exceptis ad 1 cm. diametro, pilis mollibus sericeis albis nitentibus densissime villosa-lanatae, floribus arcte congestis; bractae exteriores obovato-oblongae, breviter obtuse cuspidatae vel acuminatae, 3–3·2 mm. longae, 2 mm. latae, ciliatae, ceterum glabrae, extra conspicue glandulosae; bractae interiores anguste spathulato-ellipticae, sensim acute acuminatae, circiter 4·5 mm. longae, 1–1·3 mm. latae, densissime molliter sericeo-villosae. *Calycis* tubus 2·5–2·8 mm. longus, extra dense adpresse albo-pilosus, costis absconditis, glandulis ut videtur nullis, intus glaber; dentes triangulari-lanceolato-subulatae, 1·75–2·2 mm. longae, igitur tubo breviores, basi fere 1 mm. latae, densissime piloso-ciliatae. *Flores* haud magni; vexillum ochroleucum, lamina late ovato-subreniformi, basi cordata, 2·75 mm. longa, 3·5 mm. lata, sparse glandulosa, ungue 2–2·8 mm. longo; alae violaceo-roseae, tubo staminali longe infra medium affixae, lamina 4 mm. longa, 2·1 mm. lata, ungue 1·5–1·8 mm. longo; carinae petala libera, paulo altius affixa, violaceo-rosea, lamina 4 mm. longa, 2·8–3 mm. lata, ungue 2–2·4 mm. longo. *Stamina* tubo filamentisque liberis inclusis usque ad 6 vel 6·8 mm. longa. *Ovarium* ellipsoideum, dimidio superiore pilosum, glabrum inferiore, 1·5–1·75 mm. longum, 1 mm. latum; stylus dimidio inferiore dense pilosus, superne glaber, fere 4·5 mm. longus.

MEXICO. State of Mexico: District of Temascaltepec; llano, Nanchititla, 1100 m., Dec. 7th, 1933, *Hinton* 5314.

***Placidia grandifolia* (Donn. Sm.) I. M. Johnston var. *glabrescens* Sandwith**, var. nov.; a planta typica foliolis subtus haud dense lanatis sed glabrescentibus, costa nervisque principalibus pilosis, pagina mox glabrescente, adultis saepe omnino glabris differt; praeterea foliolis 17, stipite fructus 1–1·4 cm. longo calycem longe superante gaudens.

MEXICO. State of Mexico: District of Temascaltepec; Chorrera, 1230 m., July 29th, 1932, *Hinton* 1193 (typus floris); *ibid.*, 1350 m., Dec. 29th, 1933, *Hinton* 5419 (typus fructus). The latter collection was noted as from a tree 6 m. high. Without locality, *Bates* in Herb. Hook.

Vernacular Name, *Cahuirrica prieta*.

This differs strikingly from Guatemalan and Mexican material of the species owing to the glabrescence of the lower surface of the leaflets, but fails to provide any other good character for specific segregation. Thus *Andrieux* 441 (Kew) has up to 15 leaflets, which are densely woolly beneath; while *Nelson* 1826 (U.S. Nat.



Herb.), with leaflets woolly beneath, agrees almost exactly with Hinton's flowering material in all details of dissection, and has almost identical fruits, except for a shorter stipe. The flowers of the Guatemalan type collection (Heyde and Lux 3709) are slightly larger.

**Lonchocarpus Hintoni** *Sandwith* sp. nov.; subgeneris *Eulonchocarp*i Pittier, seriei *Impressinervorum* Pittier, ut videtur juxta *L. rugosum* Bth. ponenda, inflorescentiis plerumque praecocibus, indumento dissimili, legumine latiore pilis densissimis arcte appressis pallide griseo- vel fulvo-sericeo, ovulis 1-4 differt.

*Arbor* parva, 6-10 m. alta, ramulis summis vetustioribus valde nodoso-cicatricosis lenticellatis teretibus, hornotinis angulatis breviter adpresse pubescentibus. *Stipulae* lanceolatae, circiter 4 mm. longae. *Folia* plane evoluta adulta 10-20 cm. longa, petiolo rhachi petiolulisque gracilibus breviter pubescentibus; petiolus 3.5-5.8 cm. longus; internodia rhacheos brevia, 0.6-2.2 cm. longa; petioluli 2-4 mm. longi; foliola 13-17, oblongo-lanceolata vel oblonga, terminalia nonnunquam oblanceolata, apice obtusa rotundata sed costa excurrente breviter apiculata, basi cuneata usque rotundata, 2-6.5 cm. longa. 0.6-2.1 (nonnunquam ad 3.2 cm.?) cm. lata, adulta coriacea marginibus conspicue revolutis, epunctata, supra dense subadpresse pubescentia, subtus dense albido-strigoso-pilosula, nervis lateralibus utroque costae latere 8-10 ascendentibus, his cum costa supra conspicue impressis subtus valde prominentibus, rete venularum subtus intricato prominente. *Inflorescentiae* vulgo praecoces, rarius cum foliis junioribus expansae; racemi secus ramulos hornotinos breves dispositi, multi, saepe congesti, singuli 2.5-12 cm. longi, densiflori, ubique griseo- vel ochraceo-pubescentes. *Flores* in umbellis bifloris dispositi, vinacei vel caerulei; pedunculus umbellarum crassus, brevissimus, 0.5-1 mm. longus; pedicelli circiter 2-2.5 mm. longi; bracteolae circiter 0.3 mm. sub flore exorientes, minutae, pubescentes, lanceolatae, 0.6-1 mm. longae. *Calyx* tenuiter griseo- et fulvo-sericeo-pubescentis; tubus circiter 2.5 mm. longus; dentes 3 inferiores valde distinctae, triangulares, acutissimae, intermedia circiter 1.2 mm. longa basi 2 mm. lata, laterales breviores ad 0.75 mm. longae. *Vexillum* ungue vix 1.5 mm. longo; lamina 6.5-7.5 mm. longa, 8-8.5 mm. lata, apice emarginata, basi calloso-plicata ac auriculata vel nonnunquam truncata, extra marginibus exceptis sericeo-pubescentis. *Alae* ungue 2.5-3 mm. longo; lamina 5.3-5.75 mm. longa, 2.2-2.7 mm. lata, glabra vel extra dimidio anteriore sparse pubescens. *Carinae petala* ungue 2-3 mm. longo; lamina 5.5 mm. longa, 3-3.2 mm. lata, extra secus medium atque dimidio anteriore haud dense sericeo-pubescentis, praeterea margine superiore triente posteriore ciliata. *Stamina* glabra, tubo incluso circiter 7 mm. longa; stamen vexillare basi liberum crassum; antherae glabrae. *Ovarium* albido-sericeum, 5.5 mm. longum; stylus basi excepta glaber, arcuato-falcatus, 2.5-3 mm. longus; ovula 1-4. *Legumen* oblongo-lanceolatum vel

ellipticum, tenue, arcte applanatum, marginibus aequalibus haud incrassatis nec alatis, basi in stipitem sensim attenuatum, apice attenuatum denique obtusum vel rotundatum ac apiculatum, 6.5–10 cm. longum, 2 (1.5)–2.5 cm. latum, pilis densissimis griseis vel pallide fulvis arcte sericeum; semina ut videtur 1–2, reniformia, 6 mm. longa, vix 1 cm. lata (maturitate majora?).

MEXICO. State of Mexico: District of Temascaltepec; near Nanchititla and Limones, on hot side of mountain, tree 10 m. with blue flowers, fl. April, fr. August 1933–1934, *Hinton* 3772, 5571, 5936 (typus floris), 6508 (typus fructus), all from the same tree; Chorrera, 1230 m., on dry hill, tree 6 m. with blue flowers, May 1933, *Hinton* 3934; Los Carrisos, 570 m., shrub or tree 6 m. high on cliffs, fl. June 1932, *Hinton* 726; Palmar, 650 m., dry hill, tree 10 m., with blue flowers, June 1933, *Hinton* 4121.

State of Guerrero: banks of the Espiritu Santo, 600 m., tree 8–10 m. with wine-red flowers, April 1898, *Langlassé* 108 (identified as *L. guatemalensis* Bth. by Micheli, Leg. Langlass., p. 26); Coyuca, in barranca, tree 5–6 m. high with pink fl., April–May 1934, *Hinton* 5958 (fruit), 5977 (flower). No. 5958 has broader leaflets and smaller fruits than those of the type, the pods being only 1.5 cm. broad.

Vernacular names, *Palo de Aro* (Mexico and Guerrero, fide *Hinton* and *Langlassé*); *Cajurica* (Mexico, *Hinton* 3934); *Aricuahue* and *Zopilacuaque* (Mexico, *Hinton* 726).

The *Langlassé* collection was confused by Micheli with *L. guatemalensis* Benth., which is totally distinct in numerous characters of the leaves, flowers and fruit. The affinity of this species is clearly rather with *L. rugosus* Bth., and *L. affinis* Pittier; apparently also with *L. purpureus* Pittier, of which the fruit is unknown. *L. affinis*, of which no flowering material has been seen, appears to differ specifically, on present evidence, in the indumentum and the distinct wing of the vexillar margin of the pod. The name "*Palo de Aro* (or *Oro*)" is also applied in Guerrero to the very distinct *L. eriocarinalis* Micheli.

**Cassia** (Subgen. vel Sect. *Fistula*) **Hintoni** Sandwith sp. nov.; *C. grandi* L.f. affinis, pedicellis longioribus, petalis antherisque perfectis multo majoribus, praesertim fructu valde distincto angusto dense velutino-tomentoso differt.

*Frutex* 2–2.5 m. altus; ramuli summi siccitate nigro-purpurascentes, satis dense pilosulo-pubescentes. *Stipulae* delapsae. *Folia* gracilia, 15–22 cm. longa, petiolo rhachique satis dense pilosulis; petiolus 2.4–2.8 cm. longus, 1–2 mm. tantum diametro; internodia rhacheos 1–1.4 cm. longa; petioluli pilosuli, 1.5–2 mm. longi; foliola in exemplis visis 17–18-juga, oblonga, apice obtusa vel rotundata minute apiculata, basi rotundata inaequilatera, 2–3.5 cm. longa, 0.8–1.3 cm. lata, chartacea, utrinque regulariter pilis mollibus subadpressis satis densis pubescentia, costa subtus pilosula, subtus quam supra pallidiora, nervatione haud conspicue

elevata, nervis lateralibus utroque costae latere circiter 6-8; glandulae nullae. *Racemi* numerosi, 12-22 cm. longi, pilis pallide flavis ubique dense pubescentes, graciles, laxiflori; bractae minutae, mox caducae, ovatae vel ovato-lanceolatae, plus minusve acuminatae, ad 1.6 mm. longae, basi circiter 0.75 mm. latae; pedicelli ascendentes vel maturitate patentes, fragiles, 2.5-4.3 cm. longi, praesertim sub floribus dense pilosuli. *Sepala* ovato-oblonga, 1.3-1.45 cm. longa, 1-1.05 cm. lata, extra sparse pubescentia et densius minute velutino-puberula, siccitate flavescenti-olivacea. *Petala* ut videtur flava, ungue 3-4 mm. longo, lamina ovato-oblonga, basi rotundato-attenuata vel majora cordata, 1.8-2.2 cm. longa, 1-1.3 cm. lata, venis siccitate fuscis haud conspicuis extra pubescentibus, ceterum glabra. *Stamina* 3 inferiora longiora antheris 4 mm. longis, loculis longitudinaliter dehiscentibus dorso tantum pilosulis; 4 intermedia antheris 5 mm. longis, loculis ubique copiose pilosulis, basi appendicibus per poros lineares dehiscentibus praeditis; 3 superiora parva, imperfecta, sparse pilosula et fere glabra. *Ovarium* pilis albis mollibus patulis dense villosulum. *Fructus* teres, 35-48 cm. longus, 1-1.25 cm. diametro, insigniter dense mollissime griseo-velutino-tomentosus, haud transverse rugosus, facile praesertim per fissuras transversas decorticans; semina brunnea, 7-8 mm. longa, 5.5-6.5 mm. lata.

MEXICO. State of Mexico: District of Temascaltepec; Nanchititla, on cliff, shrub 2 m. high, fl. and fr. Feb. 23rd, 1933, *Hinton* 3440 (typus); Limones, 960 m., by the trail, shrub 2.5 m. high, fr. Jan. 30th, 1934, *Hinton* 5570; Ixtapan, fl. and fr. May 3rd, 1935, *Hinton* 7727.

A most interesting species, perfectly distinct from the comparatively few other American representatives of *Fistula* (*Cassia vera* of Britton and Rose in the North American Flora). In size and indumentum of the fruit it resembles the South Tropical African *C. abbreviata* Oliv. *C. regia* Standley, of Panama, differs in the acute leaflets, shorter pedicels, and much smaller flowers and anthers; its sepals, moreover, dry purple. *C. moschata* H.B.K. and *C. leiandra* Bth. have very different flowers and fruits.

*Cassia* (*Peiranisia*) *trichocraspedon* *Sandwith* sp. nov.; *C. Quindondilla* Micheli atque *Peiranisiae Palmeri* Britton affinis, ab illa indumento foliorum, forma foliolorum, petalis extra pilosis, indumento ovarii, fructu angustiore margine tantum ciliato differt; ab hac numero forma indumentoque foliolorum, indumento ovarii fructusque differt.

*Frutex*, c. 1 m. altus, ramulis velut petiolo rhachi petiolulisque foliorum pilis patulis plerumque sursum arcuatis copiose pubescentibus. *Stipulae* filiformi-subulatae, pilosulae, 5-6 mm. longae. *Folia* 8-14 cm. longa, petiolo 0.7-1.5 cm. longo; rhachis internodiis ad 1.5 cm. longis sed saepe multo brevioribus, glandulis singulis inter jugum imum atque summum, rarius inter juga bina inferiora, foliolorum clavatis vel elongato-subulatis et ad 4.5 mm. longis;

petioluli 1–2 mm. longi; foliola paripinnata, 9–11-juga, anguste oblonga vel oblongo-lanceolata, apice attenuata acuta vel obtusa apiculata, nonnunquam acute acuminata, basi plus minusve (nonnunquam obtuse) cuneata, 1.3–4.2 cm. longa, 0.35–1.3 cm. lata, adulta firme chartacea, utrinque copiose subadpresse pilosulo-pubescentia, nervis principalibus utrinque prominulis, rete venularum supra saepius impresso subtus manifesto. *Inflorescentiae* ex umbellis bifloris compluribus ex axillis foliorum orientibus et apice ramulorum nondum foliato paniculam formantibus compositae; umbellae pedunculo sparse patenter pilosulo 0.8–2.2 cm. longo, glandulis 2–3 inter bases pedicellorum plus minusve clavatis acutatis vel apiculatis; bractee ovatae, cymbiformes, pilosulae, circiter 2.3 mm. longae, mox deciduae; pedicelli sparse pilosuli vel fere glabri, vulgo 1.2–2.3 cm. longi. *Flores* 3.5 usque fere 4.5 cm. diametro. *Sepala* ciliata, ceterum omnino glabra vel juventute sparsissime pilosula, suborbicularia, 5–9.5 mm. longa, 4.5–9 mm. lata. *Petala* valde inaequalia, majora ad 2.8 cm. longa et 2 cm. lata, omnia extra satis copiose pilosula, intus glabra. *Stamina* 3 inferiora longiora antheris 6–7 mm. longis rostro 2–3 mm. longo terminatis; 4 superiora antheris 5 mm. longis; 3 staminodia laminis vix 2 mm. longis. *Ovarium* glabrum sed marginibus dense villosulo-ciliatis, stipite glabro vel sparse pilosulo. *Legumen* 9–12.5 cm. longum, 6.5–8 mm. latum, basi in stipitem 6–8 mm. longum attenuatum, glabrum sed marginibus conspicue copiose patenter pilosulo-ciliatis, stipite pilosulo-pubescente.

MEXICO. State of Mexico: District of Temascaltepec; Ypericones, on hill, fl. and fr. Feb. 1934, *Hinton* 5582 (typus); *ibid.*, in oak woods, c. 1600 m., fl. Dec. 1932, *Hinton* 2972; *ibid.*, in oak woods, fl. and fr. March 1934, *Hinton* 5742; Tempincla, fl. and fr. March 1932, *Hinton* 355.

Well characterized in this group by the shape and indumentum of the leaflets, the petals hairy on the back, and the conspicuously ciliate ovary and fruit.

*Mimosa egregia* *Sandwith*, sp. nov.; *M. spirocarpae* Rose speciei singulari sinaloensi certe affinis, fructu longiore recto vel leviter arcuato nec arcte spiraliter curvato primo visu distinguitur; praeterea pinnis 2–3-jugis tantum, foliolis pro rata majoribus in pinna nunquam 3-jugis, seminibus majoribus gaudet.

*Frutex* 1.5–4 m. altus, inermis vel verosimiliter sparse armatus, ramulis hornotinis foliis inflorescentiisque ubique ut in *M. spirocarpa* dense pallide velutino-pubescentibus. *Folia* petiolo eglanduloso 2.2–4 cm. longo; internodia rhacheos 2.8–4.8 cm. longa; pinnae 2–3-jugae, petiolis jugorum inferiorum 0.4–1 cm. longis superiorum ad 2 cm. longis; petioluli foliolorum brevissimi; foliola pinnarum imarum 1-juga, superiorum 1–2-juga, oblique ovata vel obovata, apice obtusa vel rotundata atque minute apiculata, basi obliqua latere superiore cuneata rotundata inferiore, 2.1–4.7 cm. longa, 1.5–3.8 cm. lata, chartacea, utrinque praesertim subtus dense

molliter subadpresse pubescentia, subtus velutina, basi palmatim 3-4-nervia costa excentrica, nervis omnibus utrinque prominulis. *Paniculae* longissimae, 22-40 cm. longae. *Spicae* numerosissimae, in quoque fasciculo 2-4, 7-9.5 cm. longae. *Flores* roseo-purpurei vel albid. *Calyx* extra sericeo-pubescent, 1 mm. longus. *Corolla* extra sericeo-pubescent, tota 2 mm. longa, lobis 1 mm. longis. *Stamina* 10. *Ovarium* oblongum vel obovoideo-oblongum, circiter 0.7 mm. longum, apice sericeum, ceterum glabrum vel glabrescens; stylus glaber, 7 mm. longus. *Legumen* rectum vel leviter arcuatum, 2.3-4.3 cm. longum, 4-5 mm. latum, ubique dense pallide velutino-pubescent, marginibus incrassatis, inter semina vulgo 4-8 vallibus transversis angustis profundis articulatum. *Semina* fusco-pulla, nitentia, 3-3.3 mm. lata, eis *M. spirocarpae* valde similia sed majora.

MEXICO. State of Guerrero: district of Coyuca; El Pochote, on hill, fl. July 1934, *Hinton* 6314 (typus floris); I. R. F. Quirio, Coyuca, fl. July 1934, *Hinton* 6296; *ibid.*, fr. Nov. 1934, *Hinton* 6907 (typus fructus). Described as a shrub 1.5-4 m. high, with pink to white flowers. No. 6907 was collected from the same plant as no. 6296.

Vernacular name, *Espino chacapo*.

Undoubtedly very close to the strange isolated Sinaloan species, *M. spirocarpa*, but immediately distinguished by the fruit, and presumably connecting Britton and Rose's *Spirocarpae* with some other group of species. The fruit resembles that of *M. calcicola* Rob., a species with capitate inflorescences in Britton and Rose's *Monancistræ*. The conceivable hypothesis that *M. spirocarpa* represents a sporting condition of *M. egregia* is not a likely one, since the fruits and seeds of *M. spirocarpa* appear to be healthy and unattacked, and there are other smaller differences in foliage between the two species.

***Acacia* (*Senegalia*) *cuernavacana* (Britton et Rose) Sandwith**, comb. nov.—*Lysiloma cuernavacana* Britton et Rose in N. Am. Fl. xxiii, pars 2, 78 (1928), excl. fruct.

MEXICO. State of Morelos: valley below Cuernavaca, 1200 m., fl. Oct. 1900, *Pringle* 8382 (U.S. Nat. Herb., typus; Herb. Kew.), distributed as *Acacia acallensis* Benth., ex char.

State of Mexico: District of Temascaltepec; Platanal, rare on dry hill, fl. Feb. 1933, *Hinton* 3355, fr. March 1934, *Hinton* 5748. Described by Hinton as a shrub 3-4 m. high, leaning on other plants, and named "Espino."

This is clearly not a *Lysiloma* on account of the free stamens present in the type collection, which, indeed, has a facies far more closely resembling the spicate species of *Senegalia*. The above collections of Hinton are provisionally associated with this species; they have a few short prickles on most of the branchlets, and elastically dehiscent fruits, characters which would provide final confirmation for the removal of this species from *Lysiloma* to *Acacia*

(sens. lat.). The fruiting collection assigned by Britton and Rose to *L. cuernavacana*, viz. *Rose and Hough 4354* (U.S. Nat. Herb.), belongs, in the opinion of the present writer, to a different species, and is of course a true *Lysiloma*. The fruits of *Hinton 5748* are glabrous, brown, slightly pruinose over the seeds, 11–12 cm. long and 1.7–2.1 cm. wide, attenuate to the apex, and attenuate at the base into a stipe 5–7 mm. long.

#### STYRACACEAE (A. A. Bullock).

***Styrax Hintoni* Bullock**, sp. nov. ; habitu *S. jaliscanae* S. Wats.,\* sed corollae lobis valvatis, foliis majoribus, floribus minoribus, filamentis staminum latioribus brevioribusque, stylo glabro differt.

*Frutex* ramosus, 4 m. altus, partibus junioribus pilis stellatis longis indutus, ramis junioribus ramulisque dense tomentosis. *Folia* alterna, elliptico-oblonga, circiter 12 cm. longa et 6 cm. lata, apice abrupte breviterque acutiuscule acuminata, basi rotundata, supra nervis satis dense pilosa, subtus praesertim nervis dense pilosa vel tomentosa, nervis lateralibus utrinsecus 7–8 ; petioli satis crassi, tomentosi, usque ad 1.3 cm. longi. *Racemi* simplices, tomentosi, pauciflori, ex axillis foliorum superiorum orti, circiter 4 cm. longi ; pedicelli 1–3 mm. longi ; bractae minutae. *Calyx* cupuliformis, 4 mm. altus, 4 mm. diametro, limbo truncato vel 5-denticulato vel 5-undulato, extra dense tomentosus, intus brevissime sed dense adpresso-sericeus. *Corolla* 1.2 cm. alta, extra breviter sericea, intus glabra ; lobi 5, erecti, anguste oblongi, acuti, circiter 8 mm. longi, aestivatione valvata. *Stamina* 10, inclusa ; filamenta applanata, lineis pilorum longitudinaliter ornata, 2.5 mm. longa ; antherae lineari-oblongae 4 mm. longae, apice obtusae. *Ovarium* breviter sericeum, ovoideo-globosum, 2.5 mm. diametro, basi constrictum, omnino liberum, 3-loculare ; ovula in quoque loculo circiter 7. *Stylus* linearis, 1 cm. longus, glaber, stigmate terminali parvo. *Fructus* non visi.

MEXICO. State of Mexico : District of Temascaltepec ; Calera, 770 m., in a wet barranca, a shrub 4 m. high, 19 April 1933, *Hinton 3798*.

Although having a superficial resemblance to *S. jaliscana* S. Wats.,\* Mr. Hinton's plant, on account of the valvate aestivation of the corolla-lobes, falls into a different subsection (*Eustyrax* subsect. *Valvatae*) of the genus. The indumentum is also of a looser kind, being composed of very long, spreading, stellate hairs, whilst that of *S. jaliscana* is denser, more closely appressed and consists of much shorter hairs. The ovary appears to remain triocular until a later stage of development than usual.

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\*Described by Watson in Proc. Amer. Acad. **26**, 144 (1891), and reduced to *S. officinalis* L. var. *jaliscana* (Wats.) Perk. by Perkins in Engl. Pflanzenr.: Styracaceae, **82** (1907). It is here restored to specific rank.

**Adenocalymma Hintoni** Sandwith, sp. nov. ; *A. inundato* Mart. ob connectivum foliaceum ultra thecas productum affinis, foliolis angustius marginatis, calyce brevior, corollae tubo extra pubescentiore, praesertim bracteis latis conspicuis rotundatis optime differt.

*Frutex* scandens ; ramuli summi novelli tenues, teretes, striati, nigrescentes, lenticellis pallidis copiose maculati, minute lepidoti, ceterum glabri vel raro pubescentes ; ramuli vetustiores pallide albogrisei, saepe nitiduli, teretes, striati, lenticellati, glabri ; consocias glandularum nodis inter petiolos haudquaquam visae ; pseudostipulae foliaceae ut videtur nullae. *Folia* trifoliolata, vel bifoliolata cirrho simplici (an semper ?) terminata ; petiolus pro aetate ramulis similis, 1·7–6·3 cm. longus ; petioluli laterales 0·8–1·8 cm. longi, terminalis pro rata saepe multo longior ; foliola ovata vel elliptica vel oblonga, apice obtuse ad 11 mm. sed saepe multo brevius cuspidata, nonnunquam retusa tantum, basi obtusa plus minusve rotundata saepe etiam distincte cordata, 2·5–13 cm. longa, 2·2–7·5 cm. lata, juniora chartacea, adulta vetusta subcoriacea, siccitate olivacea vel saepius plumbea vel fere nigrescentia, utrinque praesertim supra saepius nitidula, tenuiter anguste sed distincte cartilagineo-marginata, juventute satis sparse minute lepidota, serius glabra, nervis primariis utroque costae latere vulgo 6–8 arcuatis ascendentibus, utrinque satis laxe sed conspicue praesertim subtus prominulo-reticulata. *Inflorescentiae* axillares et terminales, racemosae et paniculatae ; racemi singuli ad 6 cm. longi, laterales saepe multo breviores, minute superne dense furfuraceo-puberuli, inferne saepe glabrescentes et minute lepidoti ; pedicelli 3–6 mm. longi, dense minute puberuli ; bractae magnae, conspicuae, late ovatae, 6–8·5 mm. longae, 5·5–9 mm. latae, extra plus minusve dense minute puberulae necnon sparse lepidotae. *Calyx* campanulatus, 4–6 mm. longus, 5–7 mm. latus, margine fragili facile irregulariter fissus atque lacero, extra dense puberulotomentellus, nonnunquam glandulis nigris patelliformibus raris adpersus. *Corolla* lutea, infundibuliformis vel campanulato-infundibuliformis, 4–5 cm. longa, limbo 3·5–4·8 cm. diametro, tubo basi usque 1 cm. angusto tum ampliato atque fauce siccitate 1·5–2 cm. lato, extra basin versus glabrescente sparse lepidoto, sursum extra satis dense conspicue furfuraceo-pubescente, intus glabro nisi zona prope insertionem staminum pubescente, lobis extra pubescentibus intus conspicue lepidotis. *Stamina* supra tubi basin 8·5–10 mm. inserta, basi pubescente excepta glabra ; longiora 1·8–2·1 cm., breviora circiter 1·6 cm. longa ; thecae antherarum circiter 2·3 mm. longae, angulo recto horizontaliter extrorsum reflexae parallelae, connectivo in lobum foliaceum conspicuum oblongum 1·5 mm. longum producto. *Staminodium* 4·5 mm. longum. *Discus* pulvinaris, usque 2 mm. altus, 2·8–3·3 mm. diametro, glaber. *Ovarium* ovoideo-ellipsoideum, circiter 3 mm. longum atque 2 mm

diametro, lepidotum ; stylus circiter 2.7–2.8 cm. longus, basi lepidota excepta glaber ; ovula biseriata, in quoque loculo 14 (vel nonnunquam pauciora ?). *Capsula* matura oblonga, 10–18.5 cm. longa, 2–3 cm. lata, apice attenuata, basi rotundata, valvis crasse lignoso-coriaceis griseis glabris intricate longitudinaliter corrugulatis crebre lenticellatis nervo mediano percursis. *Semina* transverse oblonga, 1.6–1.9 cm. longa, 5–6.5 cm. lata, glabra, nucleo crasso coriaceo brunneo vel flavo-brunneo, alis latis membranaceis hyalinis sordide albis atque brunneo-vittatis.

MEXICO. State of Mexico : District of Temascaltepec ; Bejucos, by the river, 610 m., fl. April 1933, *Hinton* 3784 (typus floris) ; *ibid.*, on llano, 610 m., fl. June 1933, *Hinton* 4137.

State of Michoacan : District of Huetamo ; Mal Paso, in barranca, fl. May 1934, *Hinton* 6027.

State of Guerrero : District of Coyuca ; Querendas, fl. July 1934, *Hinton* 6281, fr. Jan. 1935, *Hinton* 7259 (typus fructus) ; Placeres, on cliffs, fr. Jan. 1935, *Hinton* 7252 ; Cutzamala, barranca, fl. May 1935, *Hinton* 7768. Zihuatanejo, sandy soil, 30 m., fl. Aug. 1898, *Langlassé* 279.

State of Vera Cruz : prov. Cordoba, fl., *Finck* 16.

State of Tabasco : Playas de Paso-ancho, fl. July 1888, *Rovirosa* 240.

Vernacular name, *Bejuco blanco*, according to *Rovirosa*.

## II : NEW GESNERIACEAE (C. V. Morton).\*

Through the courtesy of the Director of the Royal Botanic Gardens, Kew, I have been privileged to study an interesting collection of Gesneriaceae made in the State of Mexico by Mr. George B. Hinton. It contains five new species, which are described herewith. The older species collected include *Achimenes pulchella* (L'Hér.) Hitchc., *Achimenes patens* Benth., *Achimenes heterophylla* (Mart.) DC., *Achimenes antirrhina* (DC.) Morton, comb. nov. (*Gloxinia antirrhina* DC., Prodr. vii. 534), *Plectopoma glabratum* (Zucc.) Hanst., and *Kohleria elegans* (Dcne.) Hemsl. Many of these are probably new to the State of Mexico.

***Achimenes* (Scheeria) *bella* Morton**, sp. nov. ; caulibus lanatis, foliis superioribus pseudoverticillatis brevipetiolatis crenatis, pedunculis solitariis, calycis lobis elongato-triangularibus acutis, corollis oblique infundibuliformibus caeruleis, disco annulari integro.

*Herba* tenera, usque ad 13 cm. alta. *Caules* graciles, vix ramosi, circiter 1 mm. diametro, rubescentes, dense lanato-villosi, pilis longissimis (usque 4 mm. longis, circiter 40 $\mu$  latis), hyalinis, multi-septatis. *Folia* opposita, aequalia, suprema pseudoverticillata, breviter petiolata, petiolo usque ad 10 mm. longo apicem versus marginato dense lanato-villoso ; laminae late ellipticae, usque ad 5 cm. longae et 3.5 cm. latae, membranaceae, apice rotundatae,

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basi cuneatae, in petiolum decurrentes, crenatae (basi excepta), dentibus 7–11 utroque latere late rotundatis, supra virides et sparse appresso-pilosae, subtus pallidae et lanatae. *Pedunculi* solitarii, axillares, usque ad 4 cm. longi, graciles, rubescentes, lanato-villosi. *Calycis* *tubus* brevis, dense lanatus, lobis elongato-triangularibus acutis vix 5 mm. longis extus lanatis intus glabris. *Corolla* caerulea (tubo plus minusve flavo), oblique infundibuliformis, usque ad 2·8 cm. longa, tubo extus sparse piloso basi superiore paululum gibboso circiter 3 mm. lato sursum abrupte ventricosus, fauce aperto circiter 13 mm. lato, lobis 5 fere aequalibus, circiter 8 mm. basi latis 3 mm. longis late rotundatis vix patentibus integris. *Stamina* 4, didynama, filamentis gracilibus contortis, antheris conniventibus et cohaerentibus, loculis ovalibus vel suborbicularibus discretis explanatis. *Ovarium* (i.e. pars libera) puberulum. *Discus* annularis, integer. *Stylus* crassiusculus. *Stigma* stomatomorphum. *Fructus* deest.

Type in the Kew Herbarium, collected on cliff at Luvianos, Piedra Grande, Distr. Temascaltepec, State of Mexico, Mexico, Aug. 11, 1933, by G. B. Hinton (no. 4512).

The only member of the subgenus *Scheeria* previously known, *Achimenes mexicana* (Seem.) Fritsch, is apparently not closely related to the present species, which may be distinguished as follows :

Leaves rounded at apex, crenate, the teeth few, broadly rounded ; stems lanate-villous ; corolla 2·8 cm. long or less.....*A. bella*.  
 Leaves acute, serrate, the teeth numerous, acute ; stems hirsute ; corolla about 4 cm. long.....*A. mexicana*.

***Achimenes (Dicyrta) fimbriata* Rose, sp. nov. in sched. ;** caulibus foliisque glabris, foliis cujusve paris valde inaequalibus leviter serratis, calycis tubo et segmentis glabris, segmentis lineari-lanceolatis, corollis infundibuliformibus albis, lobis magnis conspicue denticulatis, dentibus glandulosis, disco annulari integro.

*Herba* tenera, usque ad 30 cm. alta. *Caules* teneri, vix 1 mm. crassi, rubri, glabri, non ramosi. *Folia* opposita, cujusve paris valde inaequalia ; folii alteri lamina ovata vel ovato-lanceolata, usque ad 5 cm. longa et 2·6 cm. lata, apice acuminata, basi obtusa saepe obliqua, fere usque ad basin leviter serrata, supra viridis, subtus pallida, saepe rubescens, utrinque glabra, nervis secundariis 4–6-jugis arcuatis, petiolata, petiolo gracili usque ad 22 mm. longo glabro rubro ; folium alterum parvum vel interdum auriculiforme, lamina saepe lanceolata acuminata vix petiolata. *Flores* axillares, solitarii, pedicellis tenuibus glabris usque ad 10 mm. longis. *Calycis* *tubus* ovario adnatus, obconicus, circiter 3 mm. longus, glaber, lobis lineari-lanceolatis basi (0·5 mm.) connatis 3–5 mm. longis glabris patulis integris. *Corolla* alba, basin versus interdum purpureo-punctata vel lineata, tubulosa, plus minusve infundibuliformis, usque ad 2 cm. longa, glabra, tubo basi circiter 2·5 mm.

lato non saccato sursum ampliato, fauce usque ad 10 mm. lato, lobis magnis rotundatis margine conspicue eroso-denticulatis, dentibus glandulas flavescentes sessiles gerentibus. *Stamina* 4, didynama, filamentis basi corollae tubi adnatis contortis glabris, antheris connatis, loculis ovalibus discretis. *Stylus* rectus, glaber. *Stigma* stomatomorphum. *Discus* annularis, crassiusculus, integer, glaber.

Type in the U.S. National Herbarium, no. 305438, collected at Lodiego, Sinaloa, Mexico, Oct. 9-15, 1891, by *Edward Palmer* (no. 1622).

The following additional specimens have been examined: San Lucas, Distr. Temascaltepec, State of Mexico, Mexico, Sept. 14, 1933, *Hinton* 4753; Anonas, Distr. Temascaltepec, Mexico, alt. 880 meters, Sept. 9, 1933, *Hinton* 4728; Camino de los Brasilitos, Ixtagua, San Ignacio, Sinaloa, alt. 600 meters, Aug. 17, 1918, *Montes & Salazar* 484; Batel, Concordia, Sinaloa, alt. 1660 meters, Sept. 1919, *Dehesa* 1630; Cuernavaca, Morelos, Sept. 10, 1903, *Rose & Painter* 6935.

Easily distinguished from the other species of the subgenus *Dicyrta* by its glabrous stems, leaves, and calyces, and by its denticulate corolla lobes. The teeth are bordered by a row of minute sessile yellowish glands.

***Achimenes (Dicyrta) flava* Morton, sp. nov.**; caulibus gracilibus vix ramosis, foliis inaequalibus oblique ovatis utrinque sparse pilosulis, floribus axillaribus solitariis, calycis segmentis lanceolatis interdum pilosulis, corollis flavis parce maculatis, lobis magnis patentibus integris, disco annulari integro.

*Herba* gracilis, usque ad 25 cm. alta. *Rhizoma* squamosum. *Caules* tenues, rubescentes, subflexuosi, usque ad 1.5 mm. diametro, subpilosi, vix ramosi. *Folia* cujusve paris valde inaequalia, petiolata, petiolo usque ad 9 mm. longo piloso; laminae majores oblique ovatae, usque ad 7 cm. longae, basi subrotundatae, apice attenuatae, margine perspicue serratae, supra lutescenti-virides et sparse pilosulae, subtus pallidiores, praecipue in venis pilosulae vel fere glabrae, minores interdum subsimiles sed plerumque redactae et lanceolatae, circiter 1 cm. longae, brevissime petiolatae. *Pedicelli* axillares, solitarii, circiter 20 mm. longi, capillares, pilosuli, pilis saepe glanduliferis. *Calycis* *tubus* obconicus, circiter 1.5 mm. longus, sparse pilosulus vel glabratus, lobis lanceolatis, circiter 3 mm. longis, integris sparse pilosulis vel glabris. *Corolla* flava, usque ad 22 mm. longus, hypocrateriformis, tubo basi circiter 2.5 mm. lato non saccato sursum gradatim ampliato rubro-maculato pilis paucis hyalinis septatis instructo, fauce aperto usque 8 mm. lato, lobis magnis patentibus integris. *Filamenta* glabra, contorta. *Antherae* connatae, loculis discretis suborbicularibus explanatis. *Ovarium* (i.e. pars libera) glabrum. *Stigma* stomatomorphum. *Discus* annularis, crassus, integer, glaber. *Fructus* deest.

Type in the Kew Herbarium, collected at Ypericones, Distr. of Temascaltepec, State of Mexico, Mexico, Aug. 5, 1933, by G. B. Hinton (no. 4485). A second collection, Hinton 1776, is from Limones, Distr. of Temascaltepec, alt. 910 meters, Sept. 19, 1932. The type bears the notation "on cliffs," and the later collection "in the water."

The following collections in the United States National Herbarium are also to be referred to this species: Near Pedro Paulo, foothills of Sierra Madre, Tepic, Aug. 3, 1897, *Rose* 1777; between Aguacate and Dolores, Tepic, Aug. 6, 1897, *Rose* 3354; La Laja, Michoacán or Guerrero, alt. 500 meters, Sept. 21, 1898, *Langlассé* 368; Cafetal Calvario, Cerro Espino, Distr. Pochutla, Oaxaca, alt. 600 meters, Sept. 20, 1917, *Reko* 3481 p.p.

Related to *Achimenes saxicola* (Brandegee) Morton, comb. nov. (*Kohleria saxicola* Brandegee in Univ. Calif. Publ. Bot. vi. 66). This species was described under *Kohleria*, because of an erroneous observation that the disk was composed of 5 distinct glands. However, I have examined two sheets of the type collection (*Purpus* 6853, from Finca Mexiquito, Chiapas, Mexico) and find that the disk is invariably annular and entire. The habit, also, is entirely that of *Achimenes*, subgenus *Dicyrta*. Brandegee later (op. cit. 193) reduced *K. saxicola* to synonymy under *Diastema rupestre* Brandegee. I have examined a specimen of this latter species and find it to be a true *Diastema* and therefore quite unrelated. *Achimenes saxicola* may be distinguished from *A. flava*, to which it is closely related, by the pubescent free part of the ovary and by its coarser pubescence. The leaves of *A. saxicola* are strigillose on the mesophyll beneath, but those of *A. flava* are merely finely pilosulous on the veins or often glabrate.

***Achimenes* (*Dicyrta*) *obscura* Morton, sp. nov. ; ex affinitate *A. candidae* sed caulibus villosulis stramineis, foliis fere aequalibus minoribus crenatis vel raro crenato-serratis, corollae tubo non gibboso, annulo integro distinguenda.**

*Herba* tenera, usque ad 23 cm. alta, non ramosa, caulibus stramineis sulcatis villosulis circiter 1.5 mm. diametro. *Petiolus* gracilis, usque ad 4 cm. longus, laminam saepe fere aequans, villosulus. *Folia* cujusve paris subaequalia, petiolata, petiolo usque ad 4 cm. longo dense villosulo; laminae oblique ovatae, vel raro oblongae vel suborbiculares, maximae 7 cm. longae et 4.5 cm. latae, apice acutae, interdum obtusae vel rotundatae, basi obtusae vel raro acutae, membranaceae, crenatae vel crenato-serratae, supra virides et pilis minutis sparse instructae, pilis majoribus paucis interspersis, subtus pallidiores, puberulae. *Pedicelli* axillares, solitarii, basi saepe bracteolati, usque 10 mm. longi, dense glanduloso-villosuli. *Calycis* *tubus* obconicus, circiter 2 mm. longus, dense glanduloso-villosulus, lobis lineari-lanceolatis circiter 4 mm. longis integris acuminatis villosulis. *Corolla* alba, plus minusve maculata, circiter

16 mm. longa, hyprocrateriformis, tubo basi non saccato 2·5 mm. diametro, sursum paullulum ampliato sparse puberulo, fauce circiter 8 mm. diametro, lobis magnis patentibus integris. *Stamina* 4, didynama, filamentis contortis glabris, antheris conniventibus, loculis discretis ovalibus. *Ovarium* (i.e. pars libera) puberulum. *Stylus* puberulus. *Stigma* stomatomorphum. *Discus* annularis, integer.

Type in the Kew Herbarium, collected at Salitre Cañitas, Distr. of Temascaltepec, State of Mexico, Mexico, alt. 1050 meters, Sept. 6, 1933, by G. B. Hinton (no. 4705). An additional specimen in the United States National Herbarium was collected at Cafetal Calvario, Cerro Espino, Distr. Pochutla, Oaxaca, alt. 600 meters, Sept. 20, 1917, *Reko* 3481 p. p.

Related to *Achimenes candida* Lindl.,\* but that species is said to have terete glabrate stems with only a few scattered spreading hairs near the upper end. In *A. candida* the annulus is interrupted dorsally, and the leaves are larger and more obviously serrate.

***Niphaea mexicana* Morton**, sp. nov. ; caulibus non ramosis fere glabris, foliis petiolatis dentatis supra strigosis, pedunculis solitariis, corollis rotatis, lobis ovalibus obtusis.

*Herba* tenera, usque ad 26 cm. alta. *Caules* plus minusve crassi, 2-2·5 mm. diametro, non ramosi, basi nudi, apicem versus foliati, fere glabri. *Folia* cujusve paris inaequalia, petiolata, petiolo 5-30 mm. longo pilis fuscis multiseptatis villosa ; laminae ellipticae, usque ad 9 cm. longae et 5 cm. latae, membranaceae, apice acutae vel obtusae, basi rotundatae, saepe oblique, perspicue dentatae, dentibus numerosis acutis, supra leviter strigosae, subtus pallidae, venulis pilosulis. *Pedunculus* solitarius, axillaris, tenuis, circiter 3 cm. longus, pilosulus. *Calycis* *tubus* brevissimus, pilosulus, lobis lanceolatis vel oblanceolatis 4-5 mm. longis integris pilosulis. *Corolla* alba, rotata, circiter 14 mm. diametro, tubo brevissimo, circiter 1·5 mm. longo, lobis ovalibus obtusis membranaceis glabris. *Stamina* 4, aequalia, filamentis rectis 1·7 mm. longis crassis glabris, antheris magnis circiter 1·5 mm. longis et latis erectis introrsum dehiscentibus, loculis apice confluentibus rima longitudinali brevi dehiscentibus. *Staminodium* bene evolutum. *Stylus* gracilis, circiter 4·5 mm. longus, basi pilosulus, stigmate parum incrassato. *Fructus* deest.

Type in the Kew Herbarium, collected at Nanchititla, Distr. Temascaltepec, State of Mexico, Mexico, Aug. 17, 1933, by G. B. Hinton (no. 4544).

Related to *N. cupreo-virens* Lem., of which I have seen no material but which apparently differs from *N. mexicana* in several characters, as follows :

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\* Journ. Lond. Hort. Soc. 3, 317, fig. (1848)

Stems unbranched ; leaves mostly long-petiolate, never subsessile, sparsely strigose on the upper surface, dentate ; flowers few, solitary ..... *N. mexicana*.  
 Stems much branched at base ; leaves subsessile, densely velutinous-tomentulose above, crenate ; flowers numerous, subcorymbose.  
*N. cupreo-virens*.

## II—\*ADDITIONS TO THE FLORA OF CYPRUS: II.

A. K. JACKSON.

In naming a further collection of specimens recently made by Mr. A. Syngressides in Cyprus, the following species were found to be unrecorded for the island in Holmboe's "Studies on the Vegetation of Cyprus." Three of the species have not yet been collected by Mr. Syngressides ; these were noted in the Kew Herbarium while determining his collection.

***Medicago ciliaris* Krock.** Fl. Siles. 2, pt. 2, 244 (1787) ; *Willd.* Sp. 3, 1411 (1803).

Myrtou, on borders of fields, 6.5.32, *Syngressides* 452 ; In campis prope Kythraea, Apr. 1880, *Sintenis et Rigo* 475.

Generally distributed in the countries of the Mediterranean.

***Echium glomeratum* Poir.** Encycl. 8, 670 (1808).

In mont. supra Lapithos, 31.5.1880, *Sintenis et Rigo* 623.

Occurs in Asia Minor, Syria and Palestine.

***Salvia hierosolymitana* Boiss.** Diagn. Ser. 1, 12, 61 (1853) ; *Boiss.* Fl. Or. 4, 627 (1879).

Sub rupibus supra Bellapais, 27.5.1880, *Sintenis et Rigo* 116, Karpas 29.3.30, *C. B. Ussher* 89.

The species is found in Asia Minor, Syria and Palestine.

***Allium paniculatum* L.** Syst. ed. 10, 978 (1759).

In vineis prope Evriku, 10.7.1880, *Sintenis et Rigo* 863 ; Pyla, Larnaca distr., in marshy field, 8.6.34, *Syngressides* 433.

Common throughout the Mediterranean region.

***Allium stamineum* Boiss.** Diagn. Ser. 2, 4, 119 (1859).

In montibus prope Prodromo versus Lemithii, 4.7.1880, *Sintenis et Rigo* 859.

Occurs in Greece, Asia Minor, Syria, Palestine and Persia.

***Agropyron elongatum* (Host) P. Beauv.** Agrost. 102 (1812) ; *Triticum elongatum* Host, Gram. Austr. 2, 18 (1802).

Pyla, Larnaca distr. in marshes, on banks of streams, 8.6.34, *Syngressides* 427.

Common in the Mediterranean countries and South Europe generally.

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\* Continued from K.B. 1934. 273.

III.—CONTRIBUTIONS TO THE FLORA OF BORNEO  
AND OTHER MALAY ISLANDS: V. NEW AND NOTE-  
WORTHY SPECIES FROM SARAWAK, COLLECTED BY THE OXFORD  
UNIVERSITY EXPEDITION, 1932.

BURSERACEAE

(H. J. Lam, Leiden).

(Cf. H. J. Lam in Bull. Jard. Bot. Buitenz. Sér. 3, 12 : 1932)

*Canarium Endertii* H. J. Lam, *l.c.* 450.

SARAWAK. Dulit trail, primary forest on steep spur of mountain, c. 600 m. Tree about 16 m. high, 28 cm. diam., fls. crimson, inflorescences dark red, 27 Aug. 1932. *Native collector* 1487.

Vernacular name, *arasa*.

Thus far only known from E. Borneo (Koetai) : endemic.

COMPOSITAE

(Jos. Th. Koster, Leiden).

*Vernonia phanerophlebia* Merr. var. *dulitensis* Koster, var. nov. ; ramulis dense fusco-villosis, capitulis 6-7-floris.

SARAWAK. Mount Dulit, moss-forest, 1230 m., 8 Sept. 1932, *Richards* 1618.

*Vernonia arborea* Ham. var. *grandifolia* Koster, in *Blumea*, 1, 396 (1935), descr. angl.

*Folia* late elliptica, apice breviter acuminata (acumine 5 mm. lato subrotundato), basi sensim attenuata, subacuta vel subobtusula, supra sparse pilosa, parva glandulosa, subtus pubescentia (pilis brevibus curvatis basi incrassatis), nervis extremis valde reticulatis utrinque valde prominentibus. *Capitula* 6-flora. *Involucris squamulae* glabrae. *Corolla* anguste tubularis, 7-8 mm. longa, lobis 2 mm. longis linearilanceolatis acutissimis. *Achaenium* glabrum, minutissime glandulosum, 3.5 mm. longum.

SARAWAK. Mount Dulit, bank of stream on edge of cliff, circiter 1200 m., 12 Sept. 1932, *Richards* 1734.

SAPOTACEAE

(H. J. Lam, Leiden).

*Palaquium Richardsii* K. Griffioen et H. J. Lam, sp. nov. ; ex affinitate obscura forsitan nunc cum *P. Beccarii* Pierre (?) et *P. decurrente* H. J. Lam (staminibus 12, ovario 6-loculari), nunc cum *P. stipulari* Pierre et *P. globosa* H. J. Lam comparanda. Ab omnibus ob flores maximos, stamina 25-27 et ovarium 10-12-loculare distincta.

*Arbor* mediocris ; ramuli crassiusculi, teretes, 0.5-0.9-1.2 cm. crassi, novelli tomentosi, mox glabrescentes ; stipulae semipersistentes, lanceolatae, apice acutissimae, subcarinatae, intus

glabrae, extra marginibus scariosis exceptis tomentosae, 0.9–1.3 cm. longae, basi 0.5–0.8 cm. latae, e foliis adultis iam delapsae. *Folia* magna, ad ramulorum apices subconferta, late obovata, chartacea, basi acuta, interdum paullum attenuata, apice rotundata, interdum late obtusa vel minime emarginata, marginibus integra saepe plus minusve undulata, supra glabra, siccitate fusca vel fusco-livida, subtus minute denseque sericeo-tomentosa, siccitate ferruginea subnitida, demum subglabra, 14–26.5 cm. longa, 7.7–16 cm. lata, petiolis sericeo-tomentosis, 2–3.3 cm. longis; costa media supra insulcata, subtus valde prominens; nervi secundarii utrinque 15–20, angulo 55°–60° e costa adscendentes, supra haud, subtus paullum prominentes, recti, margines versus interdum leviter curvati, diminuti, haud confluentes; nervi tertiarii transversi, pergraciles, densi, inter sese paralleli, supra vix, subtus paullum conspicui. *Inflorescentiae* fasciculatae, in foliorum delapsorum axillis positaе, 4–6-florae; bracteae deltoideae tomentosae, circiter 1 mm. longae. *Pedicelli* graciles, tomentosi, 2.5–4 cm. longi, apice in calycem dilatati. *Alabastra* subacuto-ovoidea. *Flores* magni, usque ad 2.5 cm. longi stylo 0.5 cm. exserto incluso. *Calyx* biserialis, circiter 1 cm. longus, sepala 3 exteriora sericeo-tomentosa, deltoidea, angulo apicali circiter 60°, 7–8 mm. longa et lata, intus subglabra, interiora 3 ovata vel subrotundata, paulo majora, intus subglabra, extra medio tantum tomentosa marginibus late scariosis. *Corolla* intus glabra, infundibuliformis, extra marginibus petalorum anguste scariosis exceptis dense sericeo-tomentosa, 1.8 cm. longa; tubus brevis, 2–3.5 mm. longus; petala 6, oblonga, apice subacuta, circiter 1.3–1.6 cm. longa, 0.5–0.6 cm. lata, sinistrorsum convoluta (dextrorsum tegentia). *Stamina* 25–27, seriebus 2 vel 3 indistinctis valde approximatis fauce inserta, 7–9 mm. longa; filamenta vix pilosa, basi confluentia, 2–3.5 longa, antheris angustis dorso adpresse pilosis 0.5–0.6 cm. longis connectivo 1.5–2 mm. longo acutissimo elongato ornatis. *Ovarium* minute adpresse pubescens, pulviniformis, in stylum gracilem glabrum 2.2 cm. longum post anthesin in calyce inclusum contractum, circiter 10–12-loculatum; loculi 1-ovulati; ovula medio axis centralis affixa, sub-campylotropa. *Fructus* ignotus.

SARAWAK. Dulit, primary forest by torrent, under 300 m. Tree, 24 m. high, 39 cm. in diam., corolla white, calyx cream-coloured, leaves reddish-brown below, 15 Feb. 1932. *Native collector* 2605 (type in Kew Herb. and Nat. Herb. Leiden).

Vernacular name, *niatoh*.

*Palaquium* sp. aff. *P. rivulari* H. J. Lam.

SARAWAK. Dulit trail, rocky forest near torrent, under 300 m. Tree, c. 2.5 m. high, 8 Aug. 1932. *Richards* 1107.

The specimen bears very young buds, but reminds me very much of *P. rivulare* (Bull. Jard. Bot. Buitenz. sér. 3, 8, 405: 1927), thus far known from E. Borneo (Koetai) only.

*Madhuca Korthalsii* (Burck) H. J. Lam var. *typica* H. J. Lam in Bull. Jard. Bot. Buitenz. sér. 3, 7, 168, 154 (1925) ; 8, 449 (1927).

SARAWAK. Dulit, secondary forest, under 300 m. Tree, c. 35 cm. diam., fls. creamy-white with sickly-sweet scent, 31 Aug. 1932. *Richards* 1563.

Distrib.: Malay Peninsula, Sumatra, Borneo.

The specimen represents a relatively small-flowered form of this apparently rather polymorphic species.

*Planchonella obovata* (R.Br.) H. J. Lam l.c. 7, 209, 245, 266 (1925) ; 8, 473 (1927).

SARAWAK. Dulit, primary forest on crest of ridge, under 300 m. Tree, 20 m. high, 28 cm. in diam., bark shed in long brown flakes, which remain attached at the base of the tree, leaving the trunk yellow and very smooth, looking rather like a *Eucalyptus* ; 5 Feb. 1932. *Richards* 2459.

Vernacular name, *solunsor* (?).

Distrib.: India and S. China to Malay Archipelago, Philippines, New Guinea and Australia.

#### CUPULIFERAE

(E. F. Warburg, Cambridge).

*Quercus arbutifolia* Hick. et A. Cam. in Bull. Mus. Hist. Nat. Paris, 29, 598 (1923).

SARAWAK. Mt. Dulit (4th division), alt. c. 1300 m. Shady moss forest. Tree, 19 m. high, 30 cm. diam. *Richards* 1885.

Previously known only from Annam.

Vernacular name: *Impinit Batu*.

***Lithocarpus* (Sect. *Cyclobalanus*) *sarawakensis* E. F. Warburg, sp. nov.** ; species zonis cupulae indistinctis irregulariter incrassatis distincta.

*Arbor* 24 m. alta. *Ramuli* glabri, annotini lenticellis sparsis parvis albidis instructi. *Folia* elliptico-lanceolata, integra, petiolata, 6–10 cm. longa, 3–4.5 cm. lata, apice acumine obtuso curvato praedita, basi cuneata, utrinque glabra, supra paulum nitida, subtus pallidiora ; costa supra aliquanto subtus valde prominens ; nervi primarii utrinque 7–11, supra impressi, subtus prominentes, marginem versus sursum curvati, demum recurvi et ad nervum proximum juncti, nervi minores reticulum subtus satis prominens formantes ; petioli c. 1 cm. longi. *Flores* in spicis axillaribus plerumque apices ramulorum versus aggregatis dispositi, masculi et feminei in spicis distinctis. *Spicae masculae* multiflorae, 4–6 cm. longae, rhachi glabra, floribus solitariis vel geminis vel ternis ; perianthium extra puberulum, intra pubescens, 6-lobatum, lobis triangularibus ; stamina c. 12, filamentis glabris ; ovarium abortivum pubescens. *Spicae femineae* basi floribus masculis paucis saepe praeditae, c.



10 cm. longae, floribus solitariis satis remotis ; perianthium puberulum ; ovarium pubescens, stylis superne glabris subulatis. *Spicae fructiferae* 11–16 cm. longae, fructibus solitariis paucis. *Cupulae* obconicae, sessiles, parte aperta patelliformi, externe c. 1.5 cm., interne 0.5 cm. altae, 2–2.5 cm. diametro, extra tomentosae, intra indistincte pubescentes, annulis 6–9 indistinctis praeditae ; annuli irregulariter incrassati, plerumque os versus et saepe alibi obsoleti. *Glandes* hemisphaericae, quam cupulae paullo latiores, c. 2 cm. altae, parte quarta inclusa, apice acuminatae et umbonatae, furfuraceo-tomentellae ; cicatrix depressa.

SARAWAK. Mt. Dulit (4th division), alt. c. 700–900 m. Mixed rain-forest on steep slope. Tree 24 m. high, 60 cm. diam. *Native Collector* 1951.

Vernacular name, *Impinit batu* or *Berangan batu*.

**Lithocarpus** (Sect. *Cyclobalanus*) *sericobalanos* E. F. Warburg, sp. nov.; cum *L. induta* (Bl.) Rehd., cujus folia et zonae cupulae similes, comparanda, sed forma cupulae et glandis valde distincta.

*Arbor* 40 m. alta. *Ramuli* glabri, annotini fusci, lenticellis concoloribus ellipticis sparsis instructi. *Folia* integra elliptica, apice obtuse acuminata, petiolata, 8–13 cm. longa, 4–6 cm. lata, basi late cuneata et acuminata, supra satis nitentia, sparsissime puberula, subtus pallidiora puberula ; costa et nervi supra paulum subtus valde prominentes ; nervi primarii utrinque 10–11, marginem versus sursum curvati et obsolescentes, secundarii plus minusve paralleli, cum tertiariis reticulum subtus paulum prominens formantes ; petioli 1–1.5 cm. longi. *Flores* in spicis in paniculas terminales aggregatis dispositi, spicis inferioribus in axillis foliorum, masculis vel androgynis 5–18 cm. longis ; flores masculi saepissime terni, perianthio 6-lobato, lobis ovatis puberulis, staminibus c. 12 filamentis glabris, ovario abortivo puberulo ; feminei cum masculis duobus singuli, perianthio dense rufo-pubescente, ovario puberulo, stylis brevissimis. *Spicae fructiferae* 6–10 cm. longae, fructibus 1–3 solitariis. *Cupulae* 1.5–3.0 cm. diametro, 1.5–2.0 cm. altae, parte superiore patelliformes, inferiore obconicae, subsessiles, c. 8-zonatae ; zonae integrae, haud incrassatae, puberulae, marginibus fuscis, superiores angustae, inferiores triplo vel quadruplo latiores. *Glandes* depressae, apice concavae, umbonatae, paulum exsertae, c. 1 cm. altae, 2.5 cm. diametro, pallide brunneae, dense pallide sericeo-tomentellae ; cicatrix convexa, magna.

SARAWAK. Mt. Dulit (4th division), near Long Kapa, 13 Aug. 1932. Rocky primary forest. Tree estimated as 120 ft. high, diam. 3 ft. at 3 ft. from ground. Bark rather rough, scaling in small longitudinal flakes, yellowish-brown. Crown wide-spreading. *Richards* 1241.

Vernacular names, *Impinit*, *Alun* (Kenyah).

**Castanopsis lentiginosa** E. F. Warburg, sp. nov.; affinis *C. feroci* (Roxb.) Spach, a qua lenticellis magis numerosis majoribus,

nervis paucioribus, spinis cupulae brevioribus, nuce tomentosa, inter alia differt.

*Arbor* 23 m. alta. *Ramuli hornotini* stellato-pubescentes, annotini glabri, fusci, lenticellis magnis numerosis prominentibus albidis saepe confluentibus. *Gemmae* subglobosae, ad 3 mm. longae. *Folia* ovata, integra, 5–11 cm. longa, 2–4.5 cm. lata, apice acuminata, basi cuneata et secundum petiolum 1 cm. longum breviter decurrentia, supra haud nitida, glabra, subtus dense rufo-puberula et sparse fusco-lepidota; costa et nervi supra paulum impressi, subtus valde prominentes; nervi utrinque 5–7, sursum curvati, marginem versus obsolescentes; nervi minores haud conspicui. *Spicae floriferae* 2–4.5 cm. longae, dense stellato-pubescentes. *Flores* solitarii vel bini vel terni; masculi perianthio 6-lobato pubescente lobis ovatis, staminibus c. 12 filamentis glabris perianthio longioribus; feminei perianthio 3-lobato pubescente, ovario pubescente; styli desunt. *Spicae fructiferae* 6–8 cm. longae, fructibus paucis. *Cupula* subglobosa, 2 cm. diametro (spinis exclusis), rufo-tomentosa, superficie inter spinas satis visibili, spinis satis crassis prope basin 3–7-furcatis tomentosius ad 5 mm. longis, pedicello 3 mm. longo. *Nux* unica rufo-tomentosa.

SARAWAK. Mt. Dulit (3rd division), Ulu Koyan, alt. 800–900 m., 18 Sept. 1932. Heath forest. Tree, 23 m. high, 33 cm. diam. Older leaves pale reddish-brown below. *Native Collectors* 1923.

#### IV—SPARTINA TOWNSENDII AND S. BRASILIENSIS IN WARM COUNTRIES. JAMES BRYCE

##### *Spartina Townsendii*

In response to requests from various persons, firms and public bodies, a considerable quantity of rooted offsets and seeds have, since 1927, been sent from England to various places in and near the tropics.

Each consignment with which I was concerned was accompanied by a request for some information of the results. Comparatively few replies have so far been received. Only in one case known to me—Honolulu—do the subsequent records give any promise of a permanent establishment. In view of this, some account of the attempts to establish and exploit this grass may be instructive and of interest.

##### TOBAGO AND TRINIDAD.

The object of this introduction was stated to be to colonise certain sea-swamps in the hope of effecting an improvement in the healthiness of the neighbourhood and as a preparation for possible reclamation later.

Fifty offsets were taken out in April, 1933. Forty-seven were set in a small swamp on the Trois Riviere Estate, Tobago, and three in the Corvai Swamp near Port of Spain, Trinidad. On May 1st,

1933, a report stated : " After only one week the plants are showing growth of about a couple of inches in some cases." I have since heard indirectly that the Tobago plantation proved a failure.

#### BRITISH GUIANA.

In July, 1930, twenty-four plants were sent. A report dated June, 1931, stated that three plots of eight plants each were set out—" Plot A was on a sandy area of shore only covered by higher tides. After two months all plants here died. Plot B was on a bare patch of mud, also covered only by spring tides. The plants at first just held their own, and at the end of last year four had survived, though they had not spread. Now, however, only one or two shoots a few inches in height are visible. Plot C was on a bare patch of mud covered by every tide. At first the plants appeared to be establishing themselves in this situation. But at present, though four plants still survive, there has been little or no tendency to spread."\*

#### VENEZUELA.

One hundred and fifty offsets were shipped in July, 1932.

In June, 1933, the following account was received :

"The roots were planted at the end of July, 1932. In order to ascertain under what conditions they could be used to most advantage, the plants were set out in three plots, each under quite different conditions, and each properly fenced in as a protection against cattle.

The first plot was placed at the foot of a dyke, situated some distance inland, which serves to divert flood-water from the interior. At some 15 m. distance there is a canal running parallel to the dyke. The rice grass at this location was watered for some time after being planted, but died towards the end of September, 1932. At this time of year there was water in the canal, but none at the foot of the dyke. The opinion is expressed that most probably this site, the soil of which consisted of hard clay, was too dry for this species of grass.

The third plot was located on the lake shore in front of an earth dyke. The soil in this area is light yellow clay, and conditions were considered to be very favourable. This plot was also watered and for some time the grass seemed to grow well, especially at the foot of the dyke where the soil was moist. Some of the plants produced flowers, but they never became robust. This area is slowly subsiding, and the grass has gradually disappeared under the salt lake water. At present there are only three sickly-looking plants left on the bank.

From the results obtained the local management in Venezuela conclude that rice grass is unable to acclimatise itself there, probably owing to soil conditions."

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\* Martyn refers more fully to these plants and to *S. brasiliensis* in two recent papers, (1) and (2).

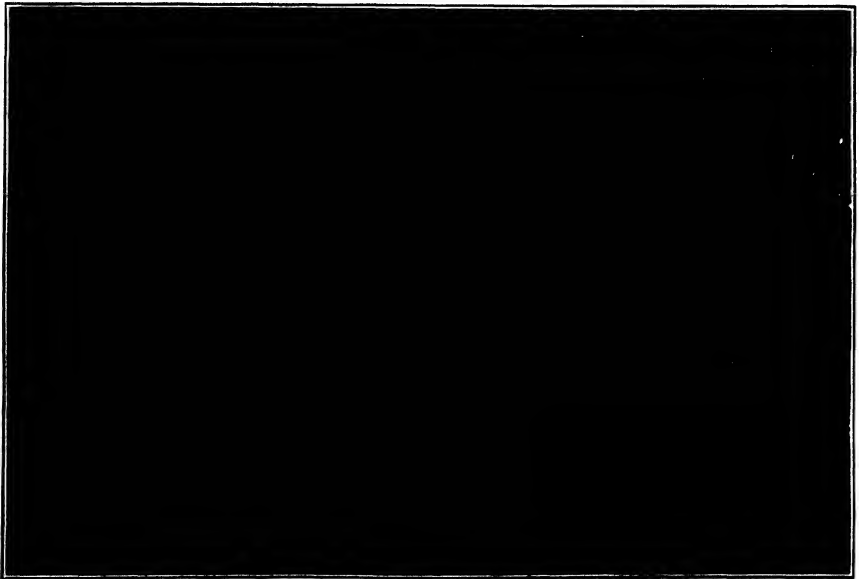


PLATE I

*Kew Bulletin*, 1936



General view of 21 months old clumps of *S. Teasdenii* in Honolulu



Nearer view of single clump at an earlier stage.

*To face page 23]*

## ANTIGUA, BARBADOS AND BERMUDA.

Small consignments of offsets have been sent to Antigua "for reclaiming mangrove swamps," to Barbados for "filling up some salt marshes having no surface connection with the sea," and to Bermuda, purpose not known. No record of the fate of these plants has been received.

## HONOLULU.

(1) In January, 1931, between two and three pounds of seed from Essex were sent to the Forestry Department, despite a recommendation that offsets would probably be much more satisfactory. No information whether this seed produced plants or not has been received. An opinion on the value of seed in this connection is given later.

(2)\* In February, 1933, offsets from Poole were planted in a swamp and all were stated to have become successfully established. By November, 1934, each had spread to cover an area of about three feet in diameter, and promised to extend to at least eight feet in a year's time.

This rate of growth easily exceeds that obtained in this country in favourable situations where an extension of diameter of one foot per annum is a very good average. The correspondent in Honolulu (Mr. S. R. Damon) believes the rapid growth to be "due to our warm water and sun."

## SUDAN.

In February, 1933, five hundred offsets were supplied to the Department of Agriculture for the "reclamation of salt lands" in the Kassala Province. The decision to make this experiment was based partly on the success which has been achieved in growing *S. Townsendii* on inland salt lands in the Riverina District, New South Wales. Similar attempts have been made in India, presently to be described. In each the object was to provide food for sheep and cattle.

Two hundred and fifty plants were set at Tokar on the Red Sea and a similar number at Kassala with the following results.

(a) *Tokar*. Towards the end of March, 1933, the plants seemed to be slowly dying. It was thought that "the soil and the water of Tokar town were not quite salt enough for them."

(b) *Kassala*. Fifty plants were set in "normal soil and watered with normal water as a control." The rest were planted in very salt soil in a garden and watered with salt water. The control plants had almost perished by the end of March, 1933. At that time the remaining two hundred were all "looking well-established and flourishing."

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\* I am indebted to the Royal Botanic Gardens, Kew, for this information and illustrations.

A later report stated that at Tokar "about half the plants appeared at first to take. But then white ants appeared and made a clean sweep."

"The plants at Kassala, except the controls, 'took' without a single exception, and seemed to be definitely established. But towards mid-April, as the heat increased, they wilted, and the advent of the hot dust-storms worried them still more. Extra watering and a certain amount of protection proved useless. The last survivors expired early in June, 1933.

In view of the fact that the grass flourished exceedingly in March and collapsed in April and May, it may be that the limits of its powers of endurance are reached at a temperature of about 104°F. In addition there was in the latter two months a good deal of hot, dusty wind, which was absent in March.

The following temperature figures (presumably 'shade') may be of interest as regards Kassala :—

		Average Maximum	Highest Maximum
March	...	102.5°F.	106.7°F.
April	...	105.3°F.	113.4°F.
May	...	104.7°F.	112.1°F.

#### INDIA.

(1) *Punjab*. In 1932, seeds and offsets were sent out at the request of the Director of Agriculture for experiment for "prevention by vegetation of denudation caused in the sub-montane districts by hill torrents and the utilization of certain large areas which contain sodium salts to such an extent as to put them out of cultivation since the ordinary crops will not grow on them."

A year later information was received that "seed and plants were tried, but the former failed to germinate and the latter died in spite of all possible care."

In 1933, the Director of Irrigation Research became interested in the possibility of utilising salt lands. Late in the year five hundred offsets of *S. Townsendii* and one hundred plants of *Glyceria maritima*, the latter on my suggestion, were despatched.

The types of soil in which they were planted and the objects of the experiment may be gathered from the following extract dated December, 1933.

"The plants arrived here in good condition and on placing in water they have sprouted. Everything so far is satisfactory.

The plants are being set on three types of land :—

- (i) What is known out here as 'Rakkar' soil. This is a hard soil, pH value of about 10.0, and a very low soluble salt content.
- (ii) 'Thur' soil. This soil is high in salts but the pH value is rarely above 8.0.

(iii) Waterlogged land adjacent to canals. This land may or may not contain much salt, but usually there are fairly large salt patches.

"In the first two cases the object is to obtain a fodder crop during reclamation in addition to actual reclamation performed by the plants themselves.

"In the third case, only an expensive drainage system makes the land suitable for cultivation. If the plants can be successfully grown under these conditions, the drainage system will be done away with and a valuable fodder area in dry seasons obtained."

No further communication has been received.

(2) *Assam*. Seeds and offsets were supplied in 1927 for experiment in the prevention of river erosion. In 1929, a report was received stating that the offsets "were planted on the banks of the Borelli river, part near the water and part higher up in soil specially prepared. The plants were kept watered during dry weather and showed some signs of growth, but eventually rotted and died off. The seed failed to germinate."

(3) *Bengal—Dacca*. Fifty offsets were sent in 1931. I have no information of the object of this experiment or of the fate of the plants.

#### SINGAPORE.

Between 1927 and 1929 repeated efforts were made to establish *Spartina* by seed and offsets on a muddy foreshore. For this reason and also because considerable detail of the operations is available, the record is given at some length.

Seeds were first sent out from Essex in December, 1927, and from Poole in January, 1928. These were sown soon after receipt in the following way.

"Small holes were made about half inch deep and about five seeds put in each, but without any result whatsoever. Some of the seeds would only have been covered with salt water twice in twenty-four hours for about two hours. Other seed would have been covered for, say, three hours."

On November 13th, 1928, more seed was despatched from Essex, in air-tight containers. An attempt was made to cause these seeds to germinate on the surface of wet mud in a box, but without success.

On November 24th, 1928, a further consignment of seed was sent from Essex. This was set one quarter inch deep in soil in a box and placed under the shade of some shrubs so that they were covered by four inches to six inches of water at each tide. None of these seeds germinated.

In May, 1929, twelve rooted offsets were sent from Essex and arrived in perfect condition. A report received stated: "I carefully planted them over an area of nearly an acre, choosing, as near as possible, mud or clay similar to what was attached to the plants



themselves. Several had nice green shoots and looked most cheerful after they were planted, but I am sorry to say every one of them has died."

The Curator of the Botanic Gardens, Singapore, who was consulted afterwards, gave the opinion that climatic conditions, especially in regard to heat, were the cause of failure.

In April, 1929, a sample of seed was sent at the request of the Director of Agriculture, Straits Settlements and Federated Malay States, but no report on them has been received.

#### AUSTRALIA.

(1) *Queensland*. Seeds sent to Mackay in February, 1928, failed to germinate. A further supply was sent in December, 1928, the fate of which is not known.

(2) *Western Australia*. In 1930 the Director, Zoological Gardens, South Perth, was interested in the introduction of *Spartina* to the north west swamps of Western Australia. Later in that year he wrote that the Agricultural Department had received some plants and had set them "in likely places along the coast." I have no further news of these.

(3) *New South Wales (Riverina District) and Victoria*. The purpose of this introduction in 1930 is best set out in the words of my correspondent, Mr. J. W. Campbell, Corobimilla, N.S.W.

"I am a wheat farmer in the Riverina district. For the past three years we have suffered a partial drought, with the result that grass is almost unknown except in irrigation areas.

"By sinking wells or boring I can get an almost unlimited supply of water very suitable for stock, but after a few applications to grass the latter will die.

"The main impurities in the water are sodium chloride, magnesium sulphate and magnesium chloride.

"I was thinking if your grass will grow when inundated by sea water, that I should be able to cultivate it with the aid of my sub-artesian flow."

In a subsequent letter Mr. Campbell states: "I have in view the possibility of areas of thousands of acres continually covered with water from artesian bores—which, whilst producing stock water destroy large grazing areas."

Analyses of the bore-water and soil in this holding have been made by the Department of Agriculture, New South Wales, and extracts are given below along with certain temperature readings supplied by Mr. Campbell.

#### *Analysis of Bore-water from Corobimilla—1926.*

	Parts per	Salinity
	100,000	
Total Solids (105°C) ...	842.0	·84%
Total Solids (180°C) ...	812.0	
Lime (CaO) ... ..	38.0	
Magnesia (MgO) ... ..	80.8	

Chlorine ... ..	376.2
Sulphuric Acid (SO <sub>4</sub> ) ...	77.8
Alkalinity expressed in terms of Calcium Carbonate ...	62.9

*Note.*—The water is unsuitable for irrigation or for ordinary domestic purposes.

*Analysis of Soil from Corobimilla—1933.*

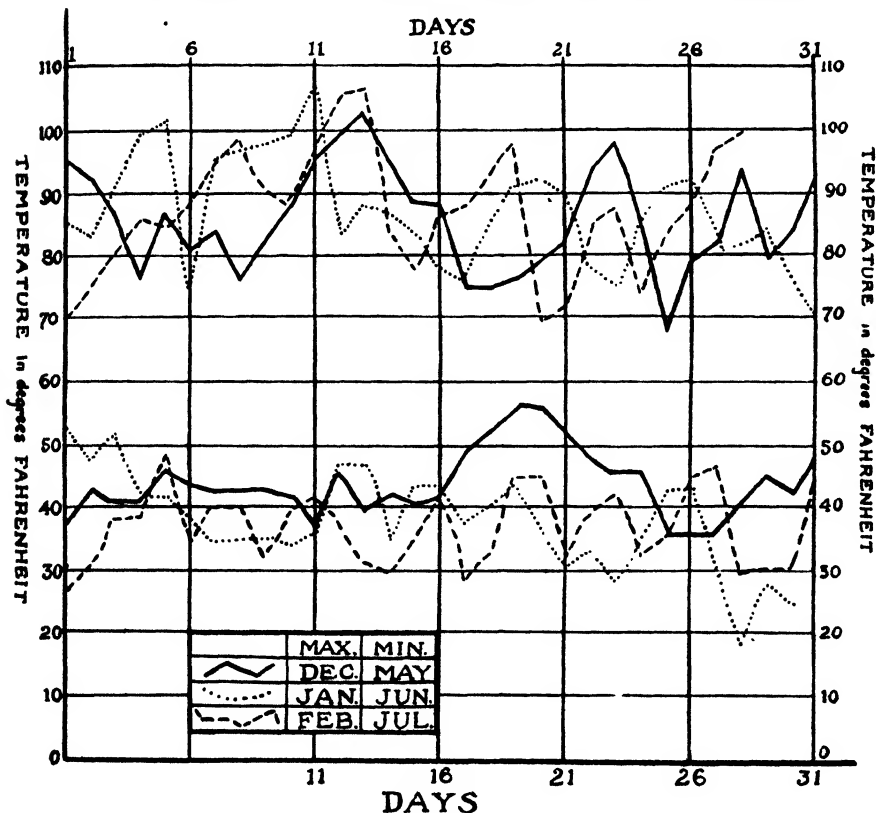
Total water-soluble salts ... ..	0.22 per cent.
Containing sodium chloride ... ..	0.113 „

In July 1930, twenty-four offsets were sent out from Essex.

In November, 1931, Mr. Campbell wrote :

“ Twenty were planted in a drain 40-ft. by 4-ft. running from the bore to a water-hole, two (which have not survived) outside the drain, and two under water-level in the hole. Those under water have far exceeded the others in growth.

“ Planting out in August (1930) the grass proceeded to



Shade temperature readings at Corobimilla, 1932-33

flower at a height of about 15 inches, but produced no seed. Then, without developing much height it began to shoot out and when winter arrived had increased about fifty times, completely covering an area 36-ft. by 2-ft.

"The first frost checked growth and it was not until late spring that it moved again. It is now making great headway." In August, 1932, Mr. Campbell reported: "We had a plague of grasshoppers that ate the grass right out and while I was waiting for it to grow up again some of my sheep got at it. Then the frosts came and it is practically dormant now."

"The grass continues to spread, but does not make a very high growth except where it is under water all the time. The average height attained in the bore-drain, which, by the way, is as often dry as wet, is about 12 to 15 inches, and at this should make an ideal grazing proposition if sufficient of it were available.

"The soil is red, sandy loam, about 15 inches deep, over a clay subsoil above rock, commonly known here as Bastard Marble. This rock outcrops on some of the rises but is generally about 30 feet below the surface on the flats.

"The country has all been thickly timbered with Cyprus Pine and Grey Box. The Grey Box grows in the lighter rainfall areas in the eastern states and is a Eucalypt.

"The rainfall here is 17 inches and the main products are wheat and wool, except for an area of irrigated land some 20 miles from here, where all kinds of farming are carried on. This is the Leeton and Griffith area and is watered from the dam at Burren Juck on the Upper Murrumbidgee.

"Many acres of this area have been destroyed by being overwatered or otherwise becoming waterlogged, and salt has risen to the surface.

"It was really with the idea of trying out *Spartina* in these areas that I first thought of it."

In August, 1933, Mr. Campbell continued; referring first to the plants in the bore-drain:

"The seasons 1931-1932, and 1932-1933 were almost a repetition of the year 1930-1931 with the exception that the tendency to multiply seemed increased and the height of the growth lessened with less tendency to flower.

"I have dug the original stems up and some of them are still alive. They were wrapped with silt or clay containing small shells so they can be identified. The plant, or rather stem, failing to seed seems to have become long-lived and hence a heavy growth of very fine grass takes place around the original planting, and it appears as though it would choke itself out in these places in time.

"The distant shoots are heavy and strong-growing like the originals.

"The grass, having developed its full height, seems to remain at that, only increasing the new shoots; but on being eaten down, very rapidly replaces the original amount of growth. "The plants in the water spread very rapidly and grew to about 6 inches above water-level and invariably seeded, or at least flowered, as I did not find any seed. All stems after flowering died down and hence we have a more thinly-spaced tussock of strong growth.

"Recently I had cause to water sheep in that water accumulated in the hole where the plants grew. Close on 30 sheep died on the first day and on tasting the water I found it so salt that it was much stronger than sea water to taste. This was due to evaporation over a period of about seven years. Naturally, I cleaned it out at once, and only after did I think of the value that an analysis of that water would have been to you.

"I had about 500 roots of *Spartina* taken from here and placed in their natural element on river mud-flats in Victoria, and find that the return to the natural state of growth is immediate so far as I can gather from correspondence."

From the foregoing it would appear that *Spartina* may prove to be of very considerable economic value in Australia on account of its ability to form a suitable fodder on inland saline soils. In 1933 the Department of Agriculture became directly interested in the matter and offsets of *Spartina Townsendii* and plants of *Glyceria maritima* were despatched for experiment

*S. Townsendii* seems to be able also to adapt itself to tidal conditions in Australia corresponding, presumably, to those to which it is accustomed in this country. In 1930 the Geelong Harbour Trust asked for a supply of plants to be grown on tidal lands which in their present condition are practically valueless." About 1000 offsets as well as seeds were supplied from Essex. The seed failed to germinate. In regard to the plants a report received in 1932 stated: "So far it is early to advise definite success. The season has of late been wet, causing the positions in which the grass has been planted to be almost inaccessible. Generally speaking the stronger clumps have fared the best." In the autumn of 1932 a further 500 "strong clumps" were despatched.

SARAWAK, HONG KONG, NEW GUINEA (RABAU), PORTUGUESE WEST AFRICA (LOBITO), SOUTH WEST AFRICA (WALVIS BAY), U.S.A. TEXAS.

Seeds or offsets have been sent to these countries. I have no information whether propagation was successfully achieved or not.

#### NOTES.

In many parts of the world a demand has arisen, and still exists, for a plant able to grow in soil more saline than the ordinary. When such a soil lies within tidal range the usual object in view

seems to be that of preparation for ultimate reclamation by consolidation and raising of level. In some instances it is also desired, in the interim, to use the plant as a food for farm stock. The latter seems to be the main objective where the saline soil is non-tidal, but also the hope has been expressed that continued cultivation might lead to a reduction in the salinity of the soil: hence the attention which has been directed towards *Spartina Townsendii*, already tested and proved in most of these respects.

From the examples quoted it is evident that most attempts hitherto to grow *S. Townsendii* in, or near, the tropics have been unsuccessful. The recent success at Honolulu was, therefore, all the more unexpected.

In some cases an opinion has been offered in explanation of the results. Only one of these—Singapore—emanated apparently from a botanist. Thus, the failure was attributed in Venezuela "probably to soil conditions"; in Singapore to climatic conditions, especially heat; in the Sudan, at Tokar, to insufficient salinity of soil and water followed by an attack of white ants, and at Kassala to high temperature and hot, dusty winds. Oddly enough the success at Honolulu is ascribed to "warm water and sun."

In the absence of sufficient data it is difficult to make a comparison of, or comment effectively on, these results.

It is clear, nevertheless, that the nearest point to the equator at which *S. Townsendii* has been established, and that with marked success, is Honolulu, between latitude 20°–21° north. The failure closest to this latitude was at Kassala in the Sudan (between 15° and 16° latitude, north). The latter station, of course, differs from the former in not being tidal; but tidal immersion is not necessarily essential, provided that the water-supply has a salinity greater than that of ordinary soil up to about 6 per cent. The salinity at Kassala is not known, but the fact that the plants grew well for several weeks before dying suggests that it was within these limits.

At Honolulu, the success was said to be due to the heat, while at Kassala the failure was put down to the same cause. It would, perhaps, be idle at this stage to carry the discussion further, but a comparison of climatic conditions at least, including the figures for atmospheric humidity, should be of assistance in determining the cause or causes of failure at Kassala, and possibly also at other places in the tropical regions.

In regard to the experiments in the tropics it is extremely likely that climatic factors, while the chief, are not the only ones to be taken into account. In this connection it need only be stated at the moment that there are a number of places in Essex apparently quite suitable for colonisation which have proved uncolonisable. In some instances this has been shown to be due to onslaughts of the common periwinkle (*Littorina littorea*), while in others the immediate cause of failure is thought to be due to great mobility of the surface mud probably caused, in turn, by the nature and direction of the tidal currents in the immediate neighbourhood.

According to my experiments and observations it is possible to establish *S. Townsendii* in tidal regions in this country where the foreshore is of a muddy nature from high water mark of spring tides down to a level about ten feet below that line, provided the population of marine and land herbivorous animals having access to the plant, at least for the early years of establishment, is not so numerous as to cause repeated defoliation, and that the surface mud is sufficiently stable to permit the growth of such plants as *Zostera*, *Vaucheria* and *Rivularia*. In addition, the experience of others has shown that it can also be grown in non-tidal regions of temperate and warm temperate zones, provided the soil has a salinity between about 1 per cent. and 6 per cent., and is not allowed to become parched.

No case is known where *S. Townsendii* has been able to maintain itself, unaided, under fresh water conditions. It is not surprising, therefore, that the several attempts to use it, in both tropical and temperate countries, for ameliorating fresh-water marshy land or for preventing river erosion have failed.

In coming to a decision on the possibility of growing *S. Townsendii* in tropical countries, or in places involving long sea voyages from the country of origin, and in valuing the attempts already made, it is essential to have in mind the viability and germination capacity of the seed, where seed has been the medium employed. Naturally, propagation by seed has distinct advantages in so far as cost and convenience in transport are concerned. But, even allowing that seed can be transported to its destination without loss of vitality, there remains the usually exceptional hazardous nature of the new habitat. Even after one year's growth under normal conditions, the young plants cannot be described as robust or able to stand up to severe conditions as is the case with good offsets from mature plants. With seed, a carefully selected seed-bed is, in my view, essential, and the young plants should not be transplanted until at least the end of their second year's growth.

Repeated germination and keeping tests over a number of years have shown that seed grown in Essex, and stored under ordinary room conditions, has a period of vitality of about fifteen weeks. During this period the germination rate declines rapidly. A good example of performance a little above the average is given in the following table :—

<i>Seed gathered in Essex November 30th, 1932.</i>				
Date Sown		Germination		
(in Copenhagen Bath).		Percentage.		
December 9th, 1932	...	...	...	82
" 24th "	...	...	...	84
January 6th, 1933	...	...	...	72
" 21st "	...	...	...	60
February 3rd, "	...	...	...	24
" 17th "	...	...	...	20
March 3rd, "	...	...	...	—

March 17th	„	...	...	2
„ 31st	„	...	...	—

According to these figures the seed, after a journey of two months, might still be expected to germinate at a rate of about 50 per cent., if sown without delay.

In no case, however, has any of the recipients in the tropics reported a germination of even one seed.

That a long journey involving the passage through the tropics appears to have a depressing effect on the germination rate of *S. Townsendii* may be illustrated with seeds sent to New Zealand. Two samples were despatched, some seeds being kept back from each for testing. Sample A was harvested on November 7th, 1928, and Sample B on November 14th, 1928. Both were posted within ten days of gathering.

Tested at Chelmsford.

Dates Set : 14.11.28.	26.1.29.	Tested in New Zealand.
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	%	%	
Sample A	56.3	56.0	{ One gave " 23 per cent. and the other less."
Sample B	73.5	42.0	

The date of the New Zealand test was not stated, but was estimated to be about the end of January, 1929.

There was, therefore, a loss during the voyage, apart from the time factor, of from about 20 per cent. to 30 per cent. A similar depreciation is known to take place in certain grass seeds shipped on a commercial scale from New Zealand to England. I am inclined to the view that in many, if not all, instances it is probable that most of the *Spartina* seeds sent to tropical destinations were inert on arrival.

In 1933, an effort was made to prolong the period of vitality and the best result was obtained by storage at a temperature of 4°C. By this means the period was prolonged to forty-two weeks. So far no opportunity of sending seeds to or through the tropics in cool storage has presented itself, but the method appears to be worth a trial where seeds are specially asked for. In the meantime, offsets are likely to give a more satisfactory test of the possibility of quickly establishing *S. Townsendii* in new areas.

### ***Spartina brasiliensis.***

This grass appears to have been used successfully in British Guiana as a forerunner to the mangrove (*Rhizophora*) in efforts to prevent coast erosion, and might therefore be more widely used with advantage in the tropics.

The following description of the method of its employment appears in "Tidal Lands" by Carey and Oliver, and is an extract from an article by Mr. A. W. Bartlett in the "Journal of the Board of Agriculture of British Guiana," vol. 1, no. 3, January, 1908.

"Mr. Junor informs me that he plants the tufts of the grass (*Spartina brasiliensis*) in rows, the rows being six feet apart,

and the plants in the rows separated by a distance of two feet. The depth at which the tufts are planted is about one foot below the surface. The grass spreads quickly, so that in a short time the plants meet to form a patch, the numerous stems of which serve to fix the mud and prevent it from being washed away by the sea. Even should the mud cover up the plants after they have been planted they are able to make their way through it in time."

"When the grass is firmly established Mr. Junor's plan is to plant the seedlings of the mangrove in amongst it. There follows a great development of roots both from the trunk and the branches of the mangrove, which after the manner of flying buttresses, firmly support the tree in the soft mud and enable it to withstand the strongest breezes and the heaviest seas. These aerial roots being more or less curved allow a certain amount of "give" or play, which is often of advantage in enabling a structure to withstand pressure without collapsing. So the mangrove tree is in many ways particularly adapted for growing along muddy sea coasts which are exposed to winds and waves. The young plants grow rapidly, and in a few years will themselves produce a crop of seedlings. The club shaped seedlings are obtainable in abundance along the coast, and should be gathered for planting when they are nearly ready to fall. All the planting that is required is merely to insert the lower pointed end of the seedling in the mud. When the mangrove trees have grown to a fair size they form a close shade, and so far as my observation goes they kill out the "wild rice" (*Spartina*), which appears to require full exposure of the sun's rays for at least a part of the daytime for its successful growth. But by the time that the mangrove trees have reached a sufficiently large size to do this, they will themselves have taken over the functions of the "wild rice" in preventing coast erosion, and hence the latter is no longer required."

Reference should also be made to the two papers by Martyn (1) and (2).

#### BIBLIOGRAPHY

(1) E. B. MARTYN. "A note on the foreshore vegetation in the neighborhood of Georgetown, British Guiana, with special reference to *Spartina brasiliensis*." *Journal Ecology*, 22, 292 (1934).

On pages 296-297, the *Spartina* Society and its development are described.

On page 298, results of experiments with *Spartina Townsendii* are described.

(2) E. B. MARTYN. *Agric. Journ. British Guiana*, 5, 277-283 (1934). The above paper is reprinted and the following supplementary note is given on page 283. "The above paper having been written in 1932, some further developments have



taken place, which it is of interest to place on record. In the first place, the plants of *Spartina Townsendii* which made such a promising start on the soft mud, were subsequently completely smothered by the local Rice Grass and two other plots set out further up the coast suffered the same fate. *Spartina Townsendii* is apparently not able to compete with *S. brasiliensis* when the two grasses occur together."

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## V—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTUM XL.

**Kadsura ananosma** Kerr (Schizandraceae); *K. chinensi* Hance affinis, floribus majoribus, foliis tenuioribus differt.

*Frutex* dioicus scandens, floribus exceptis glaber; ramuli longitudinaliter striati. *Folia* elliptica, apice breviter obtuseque acuminata, basi cuneata, 10–17 cm. longa, 4–8 cm. lata, membranacea, integra, minute glandulo-punctata, subtus secus costam glandulis furfuraceis ornata, nervis lateralibus utrinque 8–10, supra conspicuis subtus prominentibus, rete venularum utrinque subconspicuo, petiolo supra canaliculato, 1.5–2 cm. longo, suffulta. *Pedunculi* 1-flori, solitarii, ex axillis foliorum lapsorum orientes, 1.5–1.8 cm. longi. *Flos* non visus. *Flos* ♂ 2–2.5 cm. longus; perianthii folia 15, extus leviter pubescentia, margine ciliata, ab exteriori gradatim majora; exteriora late ovata, 4–11 mm. longa, 2–10 mm. lata; interiora lorata, apice rotundata, interdum leviter cucullata, ad 22 mm. longa, 8 mm. lata, 2–3 intima paulo minora. *Columna* staminea 1.6 cm. longa, conica, staminibus numerosis, antheribus rotundatis, filamentis brevibus distinctis, praedita, apice in ramulos tenues 10–15, c. 6 mm. longos, divisa.

Doi Angka, c. 1460 m., Garrett 940.

The collector notes that the flowers are yellow green, tipped red, smelling of pineapples.

**Lobelia leucanthera** Kerr (Lobeliaceae); *L. trichandrae* Wight affinis, sed caule foliisque glabris recedit.

*Herba* erecta, ad 2 m. alta, superne ramosa, ramis divaricatis. *Caulis* minute striatus, glaber. *Folia* glabra; radicalia non visa; caulina sessilia oblongo-oblancoolata, ad 17 cm. longa, 2 cm. lata, apice acuta, leviter acuminata, basi longe attenuata, margine minute callosa-serrata; folia superiora anguste lanceolata, c. 8 cm. longa, 0.8 cm. lata, superne gradatim minora. *Racemi* terminales et ramos laterales terminantes, ad 8 cm. longi. *Bractae* inferiores ad 2.5 cm. longae, 0.4 cm. latae, ovato-lanceolatae, margine minute serratae; superiores gradatim minores. *Pedicellus* glaber, ad 2 cm. longus, haud bracteolatus. *Calycis* receptaculum 2.5–3 mm. altum, glabrum, obscure costatum; laciniae lineares, acutae, ad 12.5 mm. longae, 1 mm. latae, margine integrae. *Corolla* purpurea,

c. 27 mm. longa ; tubus intus parce pilosus ; lobi superiores c. 16 mm. longi, lineares, acuti, labium inferius aequantes ; labii inferioris lobi c. 11 mm. longi, apice apiculati. *Staminum* tubus 15 mm. longus, basin versus pilosus ; antherarum tubus 6 mm. longus, pilis albis dense vestitus ; antherae duae inferiores apice penicillatae. *Capsula* semi-globosa, c. 5 mm. diametro, leviter costata.

Nan, Doi Pu Ka, c. 1700 m., in savannah, *Kerr* 4923.

***Lobelia palustris* Kerr** (Lobeliaceae) ; *L. taliensi* Diels affinis, distinguitur foliis pro rata angustioribus longioribusque, bracteis floralibus brevioribus.

*Herba* erecta, simplex, omnino glabra, ad 1.5 m. alta. *Caulis* inferne teres, laevis vel leviter striatus, superne parum costatus. *Folia* radicalia longe petiolata, lamina ad 15 cm. longa, 3 cm. lata, oblongo-lanceolata, basi longe attenuata, apice sub-obtusa, margine distanter minuteque mucronulo-dentata, nervis lateralibus utrinque circa 15, cum nervulis subtus prominulis, supra impressis, petiolo ad 11 cm. longo, anguste alato, suffulta ; folia caulina media oblongo-obovata, ad 13 cm. longa, petiolo 3 cm. longo incluso, 3 cm. lata ; folia superiora superne imminuta, sessilia, lanceolata. *Racemus* simplex, terminalis, densiflorus, ad 20 cm. longus. *Bracteae* 13–22 mm. longae, 3.5–5 mm. latae, flores haud superantes, ovato-lanceolatae, acuminatae, margine minute mucronulo-dentatae. *Pedicellus* 3–5 mm. longus, in medio bracteolis binis minutis, 1 mm. longis, instructus. *Calycis* receptaculum c. 2.5 mm. altum ; laciniae 9–11 mm. longae, 1.5 mm. latae, margine parce calloso-denticulatae. *Corolla* roseo-purpurea, 21 mm. longa, intus basin versus pilis albis parce instructa ; lobi 2 superiores lineares, c. 15 mm. longi, labium inferius trifidum excedentes. *Staminum* tubus 14 mm. longus ; antherarum tubus c. 4 mm. longus, dorso pilis albis parce instructus ; antherae inferiores duae fasciculo pilorum alborum terminantes. *Capsula* fere globosa, erecta, c. 5 mm. diametro, leviter costata. *Semina* ovoidea, vix compressa, haud marginata, superficie minute sulcatula.

Lôi, Kao Krading, c. 1200 m., in open marshy ground, *Kerr* 20113.

***Campanula rosmarinifolia* Kerr** (Campanulaceae) ; *C. sylvaticae* Wall. et *C. Robertsonii* Gamble affinis, ab ambobus ramulis robustioribus foliis crassioribus margine revolutis differt.

*Herba* perennis, caespitosa, ad 35 cm. alta, ramulis erectis cinero-tomentosis a radice crassa lignosa orientibus. *Folia* linearia vel lineari-lanceolata, sicco rigida, apice subobtusa, basi attenuata, sessilia, margine leviter undulata saepius revoluta, supra parce subtus dense pilosa, nervis obscuris, ad 25 mm. longa, 3 mm. lata. *Inflorescentia* terminalis, subcorymbosa, pauciflora, bracteis linearibus 3–5 mm. longis. *Pedicellus* tenuis ad 11 mm. longus. *Calycis* receptaculum 2 mm. altum, obscure costatum, dense breviterque

tomentosum ; lobi 3 mm. longi, margine revoluti. *Corolla* campanulata, coerulaea, 7 mm. longa, ad medium fissâ, extus parce pilosa, lobis subacutis. *Stamina* antheris 3 mm. longis, filamentis 1.5 mm. longis, basi dilatatis. *Stylus* puberulus, 5 mm. longus, stigmatibus 3 recurvis. *Capsula* matura non visa.

Kampengpet, Me Lamung, c. 800 m., in open, grassy, rocky ground, *Kerr* 6103.

***Vaccinium apricum* Fletcher** [Vacciniaceae-Vaccineae] ; *V. malaccensi* Wight affine sed bracteis minoribus, receptaculo piloso differt ; nec non *V. mekongensi* W. W. Sm. affine sed bracteis majoribus, receptaculo piloso differt.

*Frutex* ad 3 m. altus (ex *Kerr*) ; ramuli teretes, griseo-brunnei, primo parce puberuli mox glabri, lenticellis numerosis. *Folia* elliptica, apice acuta, basi cuneata vel subrotundata, 2.5-4 cm. longa, 1-2 cm. lata, coriacea, supra brunnea vel viridi-brunnea subtus pallidiora, nervis supra conspicuis, costa subtus prominente pubescente, nervis lateralibus 5-6-paribus subtus subprominulis parallelis, nervulis paucis parum obscuris, margine serrulata, petiolo 1-2 mm. longo puberulo suffulta. *Racemi* axillares et terminales ad 6 cm. longi, rhachi pilosa ; bractee late lanceolatae vel ellipticae acutae, circa 5 mm. longae 2 mm. latae, margine ciliatae ; pedicelli ad 2 mm. longi puberuli, apice cum receptaculo articulati. *Receptaculum* pilosum 1 mm. altum 1.5-2 mm. diametro. *Calyx* usque ad basim 5-partitus, segmentis deltoideis, extra puberulis, 2 mm. latis, 1 mm. altis, ciliatis. *Corolla* rubicundo-alba (ex *Kerr*) extra puberula, tubus 6 mm. longus, intus tenuiter pubescens ; lobi 1-1.25 mm. longi. *Stamina* 6 mm. longa, filamentis 2.5 mm. longis complanatis piloso-barbatis ; antherae non-aristatae. *Stylus* 6 mm. longus, glaber.

Kanburi, Kao Ri Yai, c. 1600 m., open grassy ground, *Kerr* 10385.

***Vaccinium Eberhardtii* P. Dop** var. ***pubescens* Fletcher** [Vacciniaceae-Vaccineae] ; varietas haec nova, ramulis racemisque calycibusque pubescentibus a typo recedit.

Lôi, Kao Krading, c. 1200 m., shrub c. .5 m. high, flowers white, open sandy ground, *Kerr* 8729.

*V. Eberhardtii* is known to the writer from description and illustration only. *Kerr's* plant, differing mainly in the points noted has had to be treated therefore, in the meantime, as a variety.

***Vaccinium glabrum* Fletcher** [Vaccineaceae-Vaccineae] ; *V. Garrettii* Craib affine sed pedicellis longioribus, corollae lobis glabris differt ; nec non *V. pedicellato* Fletcher affine sed calycis lobis non vel parce ciliatis differt.

*Arbor* parva circa 6 m. alta (ex *Kerr*) ; ramuli teretes vel obtuse quadrangulares, primo pallide brunnei mox cinerei vel cinereo-brunnei, puberuli vel glabri. *Folia* elliptica rarius ovata, apice

acuta, basi cuneata, 4–8 cm. longa, 2–4 cm. lata, chartacea vel subcoriacea, supra griseo-viridia vel brunnea, nitida, subtus pallidiora, utrinque glabra, venis supra parum elevatis vel tantum subconspicuis, costa subtus prominente, nervis lateralibus 4–5-paribus subtus conspicuis parallelis, margine serrulata, petiolo circa 5 mm. longo supra canaliculato glabro suffulta. *Racemi* axillares, 3–5 cm. longi, rhachi angulata glabra; pedicelli 7–8 mm. longi, glabri, apice cum receptaculo articulati. *Receptaculum* glabrum, circa 1.25 mm. altum, 2 mm. diametro. *Calyx* usque ad basim 5-partitus, segmentis deltoideis 1.75–2 mm. longis, 1.75 mm. latis, glabris non-ciliatis. *Corolla* alba (ex *Kerr*) extra glabra vel pilis paucis induta; tubus 7.5 mm. longus intus leviter pubescens; lobi 1 mm. longi, 1.5 mm. lati. *Stamina* 5.5–6 mm. longa, filamentis 3 mm. longis complanatis piloso-barbatis; antherae dorso aristis binis sursum directis ornatae. *Stylus* validus, 7 mm. longus, glaber.

Krat, Kao Kuap, c. 600 m., edge of evergreen forest, *Kerr* 17752 (pro parte).

***Vaccinium pauciflorum* Fletcher** [Vacciniaceae–Vaccineae]; *V. urceolato* Hemsl. affine sed inflorescentia minore, floribus paucioribus, foliis minoribus angustioribus differt; nec non *V. Dunaliano* Wight affine sed floribus paucioribus, foliis acuminatis apice non lineare differt.

*Ramuli* teretes, grisei, primo pubescentes mox glabri, lenticellis numerosis conspicue elevatis praediti. *Folia* ovata vel ovato-lanceolata, apice acuminata, obtusa, basi rotundata vel cuneato-rotundata, 4–11 cm. longa, 1.5–3 cm. lata, coriacea, utrinque brunnea glabra, nervis supra conspicuis, costa subtus prominente, nervis lateralibus 5–6-paribus cum nervulis subtus inconspicuis, margine integra parum recurva, petiolo circiter 2.5 mm. longo puberulo suffulta. *Racemi* axillares ad 4 cm. longi, flores 3–6; bracteae mox deciduae non visae; pedicelli 10–20 mm. longi puberuli apice cum receptaculo articulati, medio bracteolis binis suboppositis lanceolatis, circa 2 mm. longis puberulis muniti. *Calyx* usque ad basim 5-partitus, segmentis ovatis, 3 mm. longis, 2 mm. latis, extra puberulis. *Corolla* immatura 5 mm. longa glabra. *Stamina* 4 mm. longa; antherae dorso aristis binis 1 mm. longis sursum directis ornatae. *Stylus* 4.5 mm. longus, glaber. *Receptaculum* in fructu 3 mm. altum, 4 mm. diametro, puberulum.

Patalung, Kao Soi Dao, c. 600 m., epiphytic on trees in evergreen forest, *Kerr* 19215 (type). Songkla, Kao Kèo, c. 700 m., *Kerr* 15944.

***Vaccinium pedicellatum* Fletcher** [Vacciniaceae–Vaccineae]; *V. exaristato* Kurz affine, sed petiolo omnino glabro, racemis glabris, pedicellis longioribus differt.

*Arbor* circa 8 m. alta (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, grisei vel griseo-brunnei, glabri. *Folia* elliptica, apice attenuato-acuminata acuta, basi in petiolum attenuata, 5–11 cm. longa, 2–4 cm. lata, coriacea, brunnea utrinque glabra, nervis supra

conspicuis, costa subtus prominente, nervis lateralibus 4–5-paribus subtus prominulis, margine serrulata, petiolo 2–5 mm. longo supra canaliculato glabro suffulta. *Racemi* axillares ad 8 cm. longi, rhachi angulata glabra; bracteae mox deciduae non visae; pedicelli glabri 5–7 mm. longi apice cum receptaculo articulati, medio bracteolis binis subalternis linearibus 1 mm. longis muniti. *Receptaculum* glabrum 1·25 mm. altum, 1·5 mm. diametro. *Calyx* usque ad basim 5-partitus, segmentis ovatis 1·75 mm. longis 1·5 mm. latis acutis ciliatis. *Corolla* alba (ex *Kerr*); tubus 7 mm. longus extra glaber vel parce puberulus, intra tenuiter pubescens; lobi 1 mm. longi. *Stamina* 5·5 mm. longa, filamentis 3 mm. longis piloso-barbatis; antherae dorso aristis binis ornatae. *Ovarium* pilosum 1·5 mm. diametro. *Stylus* 8 mm. longus glaber.

Chiengmai, Mě Wang, c. 1060 m., by stream in pine forest, *Winit* 1386. Doi Ngao, Mûang Chêm, c. 1300 m., common along streams in evergreen forests, *Kerr* 5428 (type).

***Vaccinium siamense* Fletcher** [Vacciniaceae–Vaccineae]; *V. cambodiano* P. Dop affine sed ramulis racemisque puberulis differt.

*Arbor* ad 6 m. alta (ex *Kerr*); ramuli primo pallide brunnei et puberuli mox cinerei vel cinereo-brunnei et glabri. *Folia* ovata, elliptica vel lanceolata-elliptica, apice acuta, basi cuneata vel cuneato-rotundata, 3–8 cm. longa, 1·5–3·5 cm. lata, coriacea, brunnea vel griseo-brunnea saepe viridi-tincta, glabra, nervis supra subconspicuis saepe obscuris, costa subtus prominente, nervis lateralibus 4–6-paribus subtus subprominulis, nervis transversis subtus parce prominulis, margine serrulata vel valde serrata, petiolo 2–5 mm. longo supra canaliculato glabro vel puberulo suffulta. *Racemi* axillares et terminales 4–8 cm. longi, valde puberuli; bracteae late lanceolatae circa 10 mm. longae, 2·5 mm. latae; pedicelli puberuli 3–7 mm. longi, apice cum receptaculo articulati, medio bracteolis binis alternis fere 1 mm. longis ornati. *Receptaculum* pilosum 1·25–2 mm. altum, 2–2·5 mm. diametro. *Calyx* lobi glandulosi vel eglandulosi extra pilosi, intra parce puberuli, deltoidei, 1–1·5 mm. lati et longi. *Corolla* alba (ex *Kerr*) extra pilosa, tubus 5·5–7 mm. longus, intus pilosus vel pubescens; lobi circa 1 mm. longi. *Stamina* 4·5–5 mm. longa, filamentis 2·5–3 mm. longis complanatis piloso-barbatis; antherae aristatae vel exaristatae. *Stylus* 5·5–7 mm. longus, glaber. *Fructus* globosus circa 4 mm. diametro, puberulus.

Ubon, c. 100 m., light evergreen forest, *Kerr* 8341. Rayawng, *Put* 2711. Chantabun, Klung, under 50 m., *Kerr* 1794 (type). Krat, Kao Kuap, c. 600 m., open rocky ground, *Kerr* 17726. *Kerr* 17752 (pro parte). *Put* 2909. Sriracha forest, Nawng Yai Bu, *Mrs. D. J. Collins* 828. Chak Kaw near Nawng Yai Bu, c. 25 m., *Mrs. D. J. Collins* 1687. c. 12 m., buds pink opening white, *Mrs. D. J. Collins* 1824. Nawng Takram, c. 12 m., *Mrs. D. J. Collins*, 2260. Chumpawn, Ban Tung Maha, c. 10 m., evergreen forest *Kerr* 11362. Bang Son, *Put* 1577. Ranawng, Kao Pawta Luang

Kèo, c. 1300 m., open evergreen forest *Kerr* 16946. Langsuan, Tako, *Put* 1676. Nakawn Sritamarat, Sichon, under 50 m., sandy ground, *Kerr* 15667. Ta Samet, in *Baeckia* heath, *Kerr* 14272. Songkla, sandy ground near sea, *Kerr* 15107. Pattani, c. 25 m., common in sandy ground, *Kerr* 7236.

It will be seen from the description that the above collections represent a very variable species the nearest relationship of which is with *V. Cambodianum* P. Dop. which the writer knows from description only. Sometimes the leaf toothing is very distinct, at others very faint; there is a variation in the length of the flower and in the length of the anther which sometimes bears awns and at other times is devoid of these; also the calyx lobes may or may not be glandular. In no case, however, are the young branchlets and racemes glabrous as in Dop's plant.

***Vaccinium subobovatum* Fletcher** [Vacciniaceae-Vaccineae]; *V. viscifolio* King and Gamble affine sed pedicellis erectis non deflexis differt; nec non *V. eburneo* Ridl. affine sed foliis basi attenuatioribus differt.

*Arbor* c. 10–20 m. alta (ex *Kerr*); ramuli teretes, primo brunnei mox grisei. *Folia* elliptica subobovata vel rarius late lanceolata, apice obtusa, basi longius attenuata, 4–7 cm. longa, 1.5–4 cm. lata, subcoriacea, supra griseo-brunnea viridi-tincta nitidaque, subtus brunnea, utrinque glabra et parce glandulosa, nervis supra subconspicuis, costa subtus prominula, nervis lateralibus 5–6-paribus subtus subprominulis parallelis, nervulis paucis, margine integra parum recurva, petiolo 5–10 mm. longo supra canaliculato ibique pubescente suffulta. *Racemi* axillares ad 10 cm. longi, rhachi angulata puberula; bractae mox deciduae; pedicelli glabri vel puberuli, 3–5 mm. longi, apice cum receptaculo articulati. *Receptaculum* 1 mm. altum 2 mm. diametro, glabrum. *Calycis* tubus fere 0.5 mm. longus; lobi deltoidei vel ovato-deltoidei, obtusi, circa 1.5 mm. longi, 1.5 mm. lati, ciliati. *Corolla* alba (ex *Kerr*) immatura; tubus 3.75 mm. longus; lobi 1 mm. longi. *Stamina* 3 mm. longa, filamentis 1.5 mm. longis complanatis piloso-barbatis; antherae sine aristis. *Stylus* 4 mm. longus, glaber. *Fructus* globosus 4 mm. diametro, puberulus.

Surat, Kao Nawng, c. 800 m., evergreen forest, *Kerr* 13290 (type). Kao Luang, c. 1200 m., evergreen forest, *Kerr* 15487. Kao Luang, c. 1740 m. *Dr. Eryl Smith* 728.

***Vaccinium Winitii* Fletcher** [Vacciniaceae-Vaccineae]; *V. Garrettii* Craib affine sed corollae lobis glabris, aristis antherarum brevioribus vel absentibus differt.

*Arbor* parva circa 3.5 m. alta (ex *Garrett*); ramuli teretes, primo brunnei mox cinerei vel cinereo-brunnei, glabri. *Folia* elliptica, apice acuta, basi cuneata vel cuneato-rotundata vel rotundata, 4–9 cm. longa, 2.5–4 cm. lata, subcoriacea, sicco griseo-brunnea, venis supra conspicuis, costa subtus prominente, nervis lateralibus 5–7-paribus subtus prominulis parallelis intra marginem anasto-

mosantibus, nervulis inter se satis distantibus subtus prominulis, margine serrulata, petiolo circa 3 mm. longo, supra valde canaliculato suffulta. *Racemi* axillares et terminales, ad 8 cm. longi, rhachi angulata glabra; bracteae caducae, late lanceolatae circa 5 mm. longae, 1.5–2 mm. latae, margine glandulosae; pedicelli 2–4 mm. longi, glabri, apice cum receptaculo articulati, medio bracteolis binis subalternis fere 1.5 mm. longis ornati. *Receptaculum* glabrum, circa 1.5 mm. altum, 2 mm. diametro. *Calycis* tubus 0.5 mm. longus; lobi late deltoidei, acuti, 1 mm. longi, 1.25 mm. lati, glabri. *Corolla* alba, rubicundo-tincta (ex *Garrett*); tubus 7 mm. longus extra glaber; lobi 1 mm. longi glabri. *Stamina* 6 mm. longa, filamentis 2.75 mm. longis pilosis; antherae aristatae vel exaristatae. *Stylus* 7.5 mm. longus glaber.

Watershed between the Mê Lao-Chiengrai district and the Mê Kuang-Chiengmai district, c. 1550 m., *Garrett* 744 (type). Chiangmai, Doi Sutep, *Mrs. D. J. Collins* 1207, 1207A, 1207B. Lampang, Mê Sai Kam, c. 600 m., *Winit* 1591.

***Diplycosia epiphytica* Fletcher** [Ericaceae–Andromedeae]; *D. pilosae* Blume affinis sed nervis duabus primariis ad costam approximatis differt.

*Frutex* epiphyticus (ex *Kerr*); ramuli teretes, primo hispidi mox glabri, grisei vel griseo-brunnei. *Folia* ovata, apice longius acuminate, basi cuneata vel subrotundata, subtus brunnea et parum lucida, utrinque hispida mox glabra, nervis supra impressis, costa subtus prominente, nervis lateralibus duobus subtus prominentibus, margine recurva integra vel sparse serrulata, petiolo 5–7 mm. longo primo hispido mox glabro suffulta. *Flores* circ. 3, in fasciculis dispositi; pedicelli 5–7 mm. longi hispidi; bracteae ovatae, 1 mm. longae, 0.75 mm. latae, ciliatae. *Calyx* glaber, tubus 1.2 mm. longus; limbus 5-lobatus, lobis 2 mm. longis 2–2.5 mm. latis sparse ciliatis apice acutis. *Corolla* punicea (ex *Kerr*) glabra; tubus 4 mm. longus; limbus 5-lobatus, lobis 2 mm. longis 2 mm. latis apice obtusis. *Stamina* 10, filamentis 3 mm. longis; antherae 2.5 mm. longae. *Ovarium* globosum 2 mm. diametro; stylus 3 mm. longus.

Surat, Kao Nawng, c. 1100–1200 m., evergreen forest, *Kerr* 13272.

***Xolisma foliosa* Fletcher** [Ericaceae–Andromedeae]; *X. comptae* (W. W. Sm. et J. F. Jeff.) Rehd. affinis sed nervis infra plus minusve obscuris non elevatis, racemis foliosioribus differt.

*Frutex* circa 0.75 m. altus (ex *Kerr*), ramulis teretibus brunneis primo minute pubescentibus cito glabrescentibus. *Folia* elliptica vel oblongo-elliptica, 2–4 cm. longa, 1–2 cm. lata, apice obtusa basi rotundata vel subrotundata, coriacea, supra griseo-viridia, glabra, costa inconspicua, nervis impressis, infra griseo-brunnea, glabra vel subglabra, costa prominente, nervis lateralibus 4–5-paribus subprominulis, nervis transversis nervulisque saepe obscuris;

petiolus 2–4 mm. longus pilosus vel subglaber. *Racemi* foliosi 4–8 cm. longi pilosi; pedicelli 5 mm. longi, arcuati pilosi, basi bracteolis binis subulatis 2 mm. longis ornati. *Calycis* lobi sparse pilosi, lanceolati vel ovato-lanceolati, 3 mm. longi, ad basim 1.5 mm. lati, coriacei. *Corolla* alba (ex *Kerr*) 8–10 mm. longa, extra  $\pm$  dense et adpresse pilosula, lobis brevibus triangularibus 1 mm. longis 1.75 mm. latis. *Stamina* 10 inclusa; filamenta corollae basi adfixa, complanata, pilosa, medio geniculatim flexa, apice conspicue biaristata. *Ovarium* 1–1.5 mm. diametro, glabrum.

Lôi, Kao Krading, c. 1200 m., abundant in open grassy plateau, *Kerr* 8673.

***Lysimachia Garrettii* Fletcher** [Primulaceae–Lysimachieae]; *L. lancifoliae* Craib affinis, sed calycibus fructibusque majoribus, foliis parum latioribus differt.

*Caules* erecti, circa 20–35 cm. alti, sulcati, juventute glandulis breviter stipitatis densius tecti, glandulis mox deciduis. *Folia* alterna, elliptica vel lanceolata, apice in apiculum gradatim angustata, basi attenuata in petiolum decurrentia, 3–5 cm. longa, 1–2 cm. lata, chartacea, supra viridia, subtus pallidiora, utrinque glabra, nervis lateralibus 4–5-paribus supra saepe parum impressis, subtus cum costa prominentibus, nervulis paucis subtus subprominulis, margine anguste revoluta, glabra; petioli circa 1 cm. longi, supra canaliculati, ut caules glandulosi. *Flores* axillares, solitarii; pedicelli 2–3 cm. longi, graciles, apicem versus incrassati, sparse glandulosi. *Calyx* 5-partitus, segmentis ovato-lanceolatis caudatis, 5 mm. longis 1.5 mm. latis dorso sparse glandulosi. *Corolla* flava (ex *Garrett*) 5-partitus, segmentis ellipticis vel oblongis 10–12 mm. longis, 5 mm. latis apice rotundatis. *Stamina* 5, filamenta 1 mm. longa; antherae 7 mm. longae. *Ovarium* 1.5 mm. altum; stylus 7 mm. longus. *Capsula* 5-valvis, 5–7 mm. longa; semina fusca angulata.

Doi Angka, east spur ending in Doi Pa Mawn, c. 1630–1710 m., *Garrett* 403.

***Lysimachia oppositifolia* Fletcher** [Primulaceae–Lysimachieae]; *L. cordifoliae* Hand.-Mzt. affinis sed foliis non cordatis, calycis lobis maioribus, pedicellis validioribus differt.

*Frutex scandens* (ex *Kerr*); ramuli quadrangulares saepe parce alati, glabri, flavo-virides. *Folia* opposita, ovata, apice acuta, basi cuneata vel subrotundata, 3–6 cm. longa, 1.5–3.5 cm. lata, chartacea, utrinque glabra, subtus sparse glandulosa, supra viridia, subtus pallidiora, nervis lateralibus 3–4-paribus, subtus cum costa prominulis, nervulis paucis, margine minute ciliata; petioli (lamina saepe decurrente) 0.5–1 cm. longi, supra canaliculati sparse glandulosi. *Flores* axillares, solitarii; pedicelli 2–2.5 cm. longi, graciles, apicem versus incrassati. *Calyx* 5-partitus, segmentis lanceolatis 8 mm. longis 2 mm. latis glabris. *Corolla* flava (ex *Kerr*) 5-partitus, segmentis ellipticis 8 mm. longis 4.5 mm. latis apice rotundatis;



tubus 3 mm. longus. *Stamina* 5, filamenta 0.75 mm. longa; antherae 2.5 mm. longae. *Ovarium* globosum 1.5 mm. diametro; stylus 5 mm. longus. *Capsula* 5-valvis, 5–6 mm. longa; semina fusca angulata.

Doi Chiengdao, c. 1800 m., trailing over ground in scrub jungle, *Kerr* 6569.

***Lysimachia pilosa* Fletcher** [Primulaceae–Lysimachieae]; *L. Wilsoni* Hemsl. affinis sed pilosa nec glabra, insuper pedunculis longioribus, floribus corymbosim nec racemosim dispositis differt.

*Herba* circa 20–30 cm. alta, ramosa, caulibus hirsuto-puberulis. *Folia* alterna, ovata vel elliptica, apice acuta vel apiculata, basi in petiolum cuneatim attenuata, 4–10 cm. longa, 2–6 cm. lata, membranacea, utrinque griseo-brunnea, pilosa et sparse glandulosa, venis vix conspicuis, nervis lateralibus 4–5-paribus, margine integra ciliata; petioli 1–2.5 cm. longi. *Flores* pauci, 2–8, in corymbos terminales ramis parvis lateralibus suffultos dispositi; pedunculi 4–10 cm. longi pilosi; pedicelli 5–10 mm. longi; bractae lanceolatae circa 5 mm. longae, ciliatae. *Calyx* usque ad basim 5-partitus, segmentis ovatis vel ovato-lanceolatis 5 mm. longis 2–2.5 mm. latis pilosis. *Corolla* flava (ex *Kerr*), glabra; tubus 3 mm. longus; limbus 5-partitus, segmentis ovatis vel ellipticis 4.5–5 mm. longis 4 mm. latis apice rotundatis. *Stamina* corolla minora; filamenta 2 mm. longa; antherae 2 mm. longae. *Ovarium* globosum 1 mm. diametro; stylus staminibus vix aequilongus.

Doi Angka, c. 1500 m., in evergreen forest, *Kerr* 6341.

***Maesa crenata* Fletcher** [Myrsinaceae–Maeseae]; *M. indica* A.DC. affinis sed lineolis nervilliformibus destituta; nec non *M. montana* A.DC. affinis sed foliis maioribus latioribusque differt.

*Frutex scandens* circa 2 m. altus (ex *Kerr*); ramuli teretes, glabri vel puberuli, brunnei, lenticellis numerosis elevatis praediti. *Folia* elliptica vel oblongo-elliptica, apice acuta, basi rotundata vel subcordata, 20–25 cm. longa, 8–12 cm. lata, chartacea, viridia vel griseo-brunnea, subtus pallidiora, utrinque glabra, nervis supra conspicuis, costa subtus prominente, nervis lateralibus 8–10-paribus, nervis transversis paucis irregularibus saepe inconspicuis, lineolis nervilliformibus destituta, margine crenata, petiolo circa 2 cm. longo supra canaliculato puberulo suffulta. *Racemi* axillares, 1–3.5 cm. longi puberuli; bractae lanceolatae 1.5 mm. longae ciliatae; pedicelli 1–2 mm. longi apice bracteolis binis ovatis vel ovato-lanceolatis 0.5 mm. longis ornati. *Calyx* extra puberulus, 5-partitus, segmentis ovatis 1.5 mm. longis 1.5 mm. latis apice rotundatis ciliatis. *Corolla* alba (ex *Kerr*), glabra, in toto 2 mm. longa. *Stamina* 1 mm. longa. *Ovarium* 1 mm. diametro.

Ranawng, Lam Lieng, c. 10 m., evergreen forest, *Kerr* 16424.

This plant, obviously closely allied to *M. indica* A.DC. and *M. montana* A.DC., differs mainly in the points noted above. The

inflorescence in this genus is not a safe character on which to rely, varying greatly in length in the same species. Herbarium sheets of *M. indica* show the inflorescence up to 10 cm. or more long. Even so, Kerr's plant would seem to differ from both *M. indica* and *M. montana* in having constantly a shorter inflorescence.

***Maesa lineolata* Fletcher** [Myrsinaceae–Maeseae]; *M. indicae* A.DC. affinis sed infructescentiis minoribus differt; nec non *M. sublanceolatae* Fletcher affinis sed lineolis nervilliformibus manifestioribus differt.

*Frutex* scandens circa 2 m. altus (ex Kerr); ramuli teretes vel obtuse quadrangulares, primo sparse puberuli mox glabri, griseo-brunnei. *Folia* elliptica, apice acute attenuata, basi cuneata, 5–15 cm. longa, 3–6 cm. lata, griseo-viridia subtus saepe pallidiora, chartacea, utrinque glabra, lineolis nervilliformibus manifestis praedita, nervis supra conspicuis, costa subtus prominente, nervis lateralibus 6–8-paribus subtus prominulis parallelis, nervulis obscuris, margine dentata, petiolo circa 2 cm. longo supra canaliculato glabro suffulta. *Flores* non visi. *Infructescentia* axillaris circa 5 mm. longa glabra. *Fructus* albus (ex Kerr), ellipticus 5–7 mm. longus 3–5 mm. diametro. *Semina* minuta, nigra, rugosa.

Kanburi, Wangka, circa 200 m., by stream in bamboo forest, Kerr 10496.

A species clearly distinguished from all others by the very short infructescence and the conspicuous black lines on the leaves.

***Maesa paniculata* A.DC. var. *pauciflora* Fletcher** [Myrsinaceae–Maeseae]; a typo inflorescentia minore non-ramoso differt.

Pattani, Betong, c. 300 m., scrambling shrub c. 2.5 m. high, flowers white, evergreen forest, Kerr 7654.

***Maesa sublanceolata* Fletcher** [Myrsinaceae–Maeseae]; *M. indicae* A.DC. affinis sed foliis sublanceolatis nec ellipticis, margine inaequaliter nec aequabiliter crenata differt.

*Frutex scandens* circa 1.5 m. altus (ex Kerr); ramuli teretes, glabri vel sparse puberuli, brunnei, lenticellis numerosis conspicue elevatis praediti. *Folia* sublanceolata vel lanceolata, apice acuta, basi rotundata, 17–25 cm. longa, 4–8 cm. lata, chartacea, supra viridi-grisea vel griseo-brunnea, subtus pallidiora, utrinque glabra, lineolis nervilliformibus manifestis praedita, nervis supra vix conspicuis, costa subtus prominente, nervis lateralibus 5–7-paribus subtus prominulis parallelis, nervulis obscuris, margine leviter inaequaliter crenata, petiolo circa 1 cm. longo supra canaliculato glabro suffulta. *Inflorescentiae* paniculatae vel rarius racemosae, 2–4 cm. longae, puberulae; bractae lanceolatae circa 1 mm. longae ciliatae; pedicelli 1.5 mm. longi apice bracteolis binis minutis ornati. *Calyx* extra puberulus 5-partitus, segmentis deltoideis 1 mm. longis 1 mm. latis ciliatis. *Corolla* alba (ex Kerr), in toto 2 mm. longa. *Stamina* circa 1 mm. longa. *Ovarium* 1 mm. diametro.

Chumpawn. Ta Ngaw, c. 50 m., evergreen forest, *Kerr* 11476 (type). Ranawng, Pakchan, under 50 m., scrub, *Kerr* 11690. Songkla, Ban Wangsai, c. 50 m., evergreen forest by stream, *Kerr* 15863.

It may be that here there is a mixture. The Ranawng plant differs in having the dark lines on the leaves more easily seen and in the leaves drying more green in colour. In the Chumpawn plant the lines can sometimes be seen especially in the young leaves. The only material to hand of the Ranawng plant is one small twig and under the circumstances the writer does not feel justified in separating the two plants. Similarly the Songkla plant is represented by a twig only, the leaves of which are more elliptic than in the other two collections. But until further material be available this plant should not be separated.

**Rapanea subpedicellata** *Fletcher* [Myrsinaceae–Eumyrsineae]; *R. umbellulatae* (Wall.) Mez affinis sed pedicellis brevioribus, calycis lobis parum maioribus differt.

*Arbor* parva circa 3 m. alta (ex *Kerr*); ramuli teretes, crassiusculi, sparse puberuli mox glabri, brunnei vel griseo-brunnei, lenticellis numerosis parvis elevatis praediti. *Folia* elliptica vel oblongo-elliptica, apice rotundata, basi longe cuneata, 5–9 cm. longa, 2–3 cm. lata, coriacea, supra brunnea viridi-tincta nitidaque, subtus brunnea vel griseo-brunnea, utrinque glabra, costa subtus prominente, nervis lateralibus numerosis parallelis inconspicuis, subtus punctulis crebris aterrimis conspersa, margine integra recurva, petiolo 5–8 mm. longo, canaliculato glabro vel sparse piloso suffulta. *Inflorescentiae* e ramulis breviter verruculiformibus formatae 3–7-florae, umbelliformes, pedicellis ad 1 mm. longis glabris. *Sepala* basi coalita, ovata vel ovato-triangularia, circa 1 mm. longa, 1 mm. lata, apice rotundata, glanduloso-punctata, ciliata. *Drupae* purpureae (ex *Kerr*), pyriformes, circa 3–4 mm. longae, 3–4 mm. diametro.

Ranawng, Kao Pawta Luang Kêo, c. 1300 m., open evergreen forest, *Kerr* 16968.

**Embellia calcarea** *Fletcher* [Myrsinaceae–Eumyrsineae]; *E. grandifoliae* *Fletcher* affinis sed foliis angustioribus basi attenuatioribus, axe inflorescentiae crassiore differt.

*Frutex scandens* (ex *Henderson*); ramuli crassi, verrucosi, glabri, brunnei vel griseo-brunnei, lenticellis numerosis conspicue elevatis praediti. *Folia* obovata, apice obtusa, basi longe acuminata, 9–18 cm. longa, 5–7 cm. lata, subcoriacea, utrinque brunnea nitida glabraque, nervis supra conspicuis costa subtus prominente, nervis lateralibus subtus prominulis numerosis parallelis intra marginem arcuatis, subtus punctulis atris breviter lineoliformibus praedita, margine integra, petiolo 1.5–2 cm. longo supra canaliculato glabro suffulta. *Inflorescentiae* laterales simplices spiciformes, axe crasso verrucoso glabro. *Flores* 4-meri. *Calycis* lobi ovati obtusi, in

fructu circa 2 mm. longi, 1.5 mm. lati, ciliati. *Fructus* globosus, circa 12 mm. diametro. *Semen* subglobosum 8 mm. diametro.

Langkawi, Selat Panchor, c. 15 m., climbing on limestone, *Henderson* 29086.

***Embellia disticha* Fletcher** [Myrsinaceae–Eumyrsineae]; *E. pulchellae* Mez affinis sed foliis cordatis, floribus sessilibus vel subsessilibus minoribus punctatis differt.

*Frutex scandens* (ex Kerr); ramuli graciles, teretes, pilis patentibus dense obtecti, lenticellis numerosis conspicue elevatis praediti. *Folia* optime distiche ordinata, ovata, apice rotundata, basi cordata vel subcordata, 1–2.5 cm. longa, 0.75–1 cm. lata, chartacea vel subcoriacea, utrinque brunnea, costa utrinque glabra supra conspicua subtus prominente, nervis lateralibus numerosis inconspicuis parallelis, subtus perregulariter punctulis minutis immersis permultis praedita, margine integra, petiolo 1 mm. longo piloso suffulta. *Inflorescentiae* pauciflorae, subumbellatae, dense ferrugineo-glandulosae, 2–5 mm. longae. *Flores* sessiles vel subsessiles, 4–5 meri. *Sepala* basi breviter coalita, lobis lanceolatis obtusis circa 1 mm. longis punctatis dorso margineque longe pilosis. *Corolla* 2.5 mm. longa; segmenta ovata apice rotundata, circa 1.5 mm. longa, 1–1.5 mm. lata, sparse punctata, extra pilosa ciliata, intra papillosa. *Stamina* 1.5 mm. longa; antherae dorso punctatae. *Ovarium* floris ♂ reductum.

Nan, Doi Pu Ka, c. 1700 m., evergreen forest, *Kerr* 4922.

***Embellia grandifolia* Fletcher** [Myrsinaceae–Eumyrsineae]; *E. subcoriaceae* (C. B. Clarke) Mez affinis sed floribus sessilibus differt.

*Frutex scandens*; ramuli teretes vel obtuse quadrangulares, glabri, brunnei, lenticellis paucis elevatis praediti. *Folia* obovata vel late elliptica, apice breviter acuminata, basi longe cuneata, 10–20 cm. longa, 6–12 cm. lata, coriacea, supra brunnea nitidaque, subtus pallidiora, utrinque glabra, nervis supra conspicuis, costa subtus prominente, nervis lateralibus utrinque numerosis parallelis intra marginem arcuatis, petiolo circa 2.5 cm. longo supra canaliculato glabro suffulta. *Inflorescentiae* omnes laterales in ligno bienni e squamulis imbricatis provenientes, simplices, spiciformes, 2–4 cm. longae, glabrae; bracteae lanceolatae, coriaceae, circa 1.5 mm. longae, acutae. *Calyx* fere ad basim 4-partitus, circa 1.75 mm. longus, segmentis ovatis 1 mm. latis ciliatis punctatis. *Corollae* segmenta 4, elliptica vel oblonga, apice rotundata, 3 mm. longa, 1.75 mm. lata, intra puberula, ciliata, valde punctata. *Stamina* corolla longiora; filamenta 3.5 mm. longa; antherae circa 1.5 mm. longae dorso punctatae. *Ovarium* floris ♂ reductum.

Chantabun, Kao Sabap, c. 100 m., evergreen forest, *Kerr* 18032.

In his monograph Mex has the flowers of *E. subcoriacea* 5-merous. This is an error as the flowers of Clarke's plant are 4-merous.

**Embellia impressa** *Fletcher* [Myrsinaceae–Eumyrsineae]; *E. sootepensi* Craib affinis sed foliis oblongis coriaceis paene integris basi rotundatis, racemis brevioribus differt.

*Frutex scandens* (ex *Kerr*); ramuli obtuse quadrangulares, primo valde pilosi mox fere glabri, brunnei, lenticellis paucis praediti. *Folia* oblonga vel oblongo-elliptica, apice late obtusa, basi rotundata vel subcuneata, 5–11 cm. longa, 2–4 cm. lata, chartacea vel coriacea, supra suffusco-brunnea subtus pallidiora, utrinque glabra vel subtus ad costam sparse puberula, nervis supra impressis subtus prominentibus, nervis lateralibus 12–14-paribus parallelis intra marginem arcuatis, margine sparse serrulata vel integra, petiolo circa 5–7 mm. longo supra canaliculato irregulariter alato cinereo-puberulo suffulta. *Inflorescentiae* racemosae 0.5–2 cm. longae furfuraceae; pedicelli circa 1.5 mm. longi; bractae minutae ovatae furfuraceae. *Sepala* basi coalita, ovata obtusa, 0.5 mm. longa, 0.75 mm. lata, pauci-punctata. *Corollae* segmenta oblonga vel elliptica, apice rotundata, 2 mm. longa, 1.25–1.5 mm. lata, extra glabra, intra sparse papillosa, punctata. *Stamina* circa 2 mm. longa, antheris 0.75 mm. longis dorso-punctatis.

Chiengmai, Doi Suteh, c. 1250 m., evergreen forest, *Kerr* 3509 (type). Doi Ka, c. 1340 m., evergreen forest, *Winit* 1365.

**E. impressa** *Fletcher* var. **serrata** *Fletcher* [Myrsinaceae–Eumyrsineae]; a planta typica foliis serratis, racemis pedicellisque longioribus, bracteis maioribus differt.

Chiengmai, Doi Suteh, c. 1500 m., evergreen forest, *Kerr* 3505.

This plant, differing from the type mainly in the points noted above, is also much more strongly lenticellate. When more fully represented it may have to be accorded specific rank.

**Embellia Kerrii** *Fletcher* [Myrsinaceae–Eumyrsineae]; *E. nutanti* Wall. affinis, foliis integris minoribus acuminatis, lenticellis numerosioribus, racemis longioribus, petalis valde punctatis differt.

*Frutex scandens*; ramuli teretes vel obtuse quadrangulares, juventute pilosi, mox fere glabri, brunnei, lenticellis numerosis et conspicue elevatis praediti. *Folia* elliptica vel oblongo-elliptica, apice obtusa, basi cuneata vel subrotundata, 3–10 cm. longa, 2–3 cm. lata, chartacea, utrinque brunnea vel griseo-brunnea, supra glabra, subtus costa sparse puberula, supra costa impressa subtus prominente, nervis lateralibus 8–12-paribus intra marginem arcuatis subtus prominulis, margine integra, petiolo 5–7 mm. longo supra canaliculato cinereo-puberulo irregulariter alato suffulta. *Inflorescentiae* paniculatae vel racemosae, ad 4 cm. longae, pedicelli 2–3 mm. longi, ut rhachis glanduloso-furfuracei; bractae filiformes circiter 1 mm. longae, furfuraceae. *Sepala* basi breviter coalita, ovata, acuta, 1 mm. longa, 1 mm. lata, dorso glanduloso-

puberula, ciliata, pauci-punctata. *Corollae* segmenta oblonga, apice rotundata, circa 3.5 mm. longa, 2 mm. lata, extra glabra vel puberula, ciliata, intra papillosa, manifestius punctata. *Stamina* circa 2 mm. longa, antheris 1 mm. longis dorso punctatis. *Ovarium* floris ♂ reductum.

Korat, Kao Lêm, c. 1000 m., evergreen forest, *Kerr* 9929, 9929A, *Put* 3533 (type).

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## VI—ACHYROSPERMUM IN TROPICAL AFRICA.

E. A. BRUCE.

The genus *Achyrosperrum* ("chaffy seed," referring to the membranous scales at the apex of the nucules) was founded by Blume <sup>(1)</sup> in 1826, on two species, *A. densiflorum* and *A. phlomoides*, both from Java. In 1836 and 1848 Benthams tentatively added two other species, *A. fruticosum* <sup>(2)</sup> (Mascarenes) and *A. philippinense* <sup>(3)</sup> (Philippines), and also included under the generic synonymy *Siphotoxis* and *Lamprostachys* Boj. mss. Subsequently Benthams and Hooker f. <sup>(4)</sup> amplified Blumes description to accommodate two additional species and extended the geography to the Seychelles and Angola. They placed the genus in the subtribe *Lamieae* of *Stachydeae*. Hooker f. <sup>(5)</sup> in 1885 transferred *Teucrium Wallichianum* Benth. to *Achyrosperrum*, thus further extending the geographical range to include India. Baker <sup>(6)</sup> in 1900 described three new and recognized in all eight distinct species from Tropical Africa.

After this little was added until 1921, when Miss Janet Perkins <sup>(7)</sup> published a paper on "The African Species of *Achyrosperrum*." Miss Perkins revised the concept of a number of the species in the "Flora of Tropical Africa" and published several new ones. In addition to this she determined the true position of *Elsholtzia Schimper* Hochst., and transferred this species from *Elsholtzia* Willd. to *Achyrosperrum* Blume. *Elsholtzia Schimper* Hochst. was founded on a specimen collected by Schimper (no. 1411) in Abyssinia in 1842. This remained a *nomen nudum* until 1894, when a description was published by J. Briquet <sup>(8)</sup>. Baker <sup>(6)</sup> retained the species in *Elsholtzia* and also published under *Achyrosperrum*, in the same work, three new species of the "Schimper Type":—*A. cryptanthum* Bak., *A. nyasanum* Bak. and *A. africanum* Hk. f. ex Bak. Miss Perkins reduced these and *A. aethiopicum*

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<sup>(1)</sup> Blume, Bijdr. 840 (1826). <sup>(2)</sup> Benth. Lab. 643 (1836). <sup>(3)</sup> DC. Prod. 12, 458 (1848). <sup>(4)</sup> Benth. & Hk. f. Gen. Plant. 2, 1208 (1876). <sup>(5)</sup> Hook. f. Fl. Brit. India 4, 2; 673 (1885). <sup>(6)</sup> Baker in Dyer, Fl. Trop. Afr. 5, 463 (1900). <sup>(7)</sup> Perkins in Notizbl. Bot. Gart. Berlin, 8, 78 (1921). <sup>(8)</sup> Briq. in Bull. Herb. Boiss. 2, 133 (1894). <sup>(9)</sup> Bak. in Dyer, Fl. Trop. Afr. 5, 451 (1900).

Welw. to synonyms of *A. Schimperi* Perk. I cannot agree with this concept of *A. Schimperi* and have found it necessary, in revising the African material, to revive some of these names, and in addition to make two new species and one new combination.

Seventeen species are here recognized from Africa :—six from West Africa (French Guinea—Cameroons), four from East Africa <sup>(10)</sup> (Abyssinia, Kenya, Uganda and Tanganyika), one from the Belgian Congo and two from South Tropical Africa (Angola, Rhodesia and Nyasaland). In addition to these one species is common to the Cameroons and Congo, one to the Congo and N. Rhodesia, one to the Congo and East Africa, and two to East and South Tropical Africa (see fig. 2). The complete geographical range is from French Guinea across to Abyssinia in the East, then south to Rhodesia, through the Mascarenes to N.E. India, Malaya and the Philippines (see fig. 1).

The genus *Achyrospermum* is shade-loving and is usually found among dense vegetation in the undergrowth of rain-forests, or in moist places on river banks. It varies in habit from perennial herbs to straggling shrubs, but is always characterized by its dense spiciform inflorescences. These may be either terminal and axillary, or only axillary. The former is typical of the herbaceous perennial, whilst the latter is to be found among some of the shrubby forms, where the inflorescence is often borne on the woody branches remote from the leaves, as in *A. Carvalhi* (see fig. 3).

The genus is most closely related to *Colquhounia* from S.E. Asia, the connecting link being through *A. fruticosum*, a Mascarene

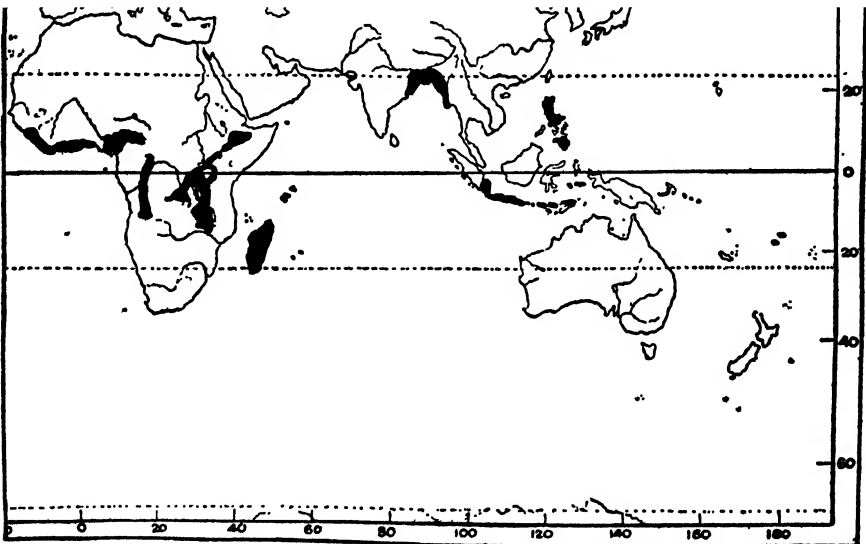
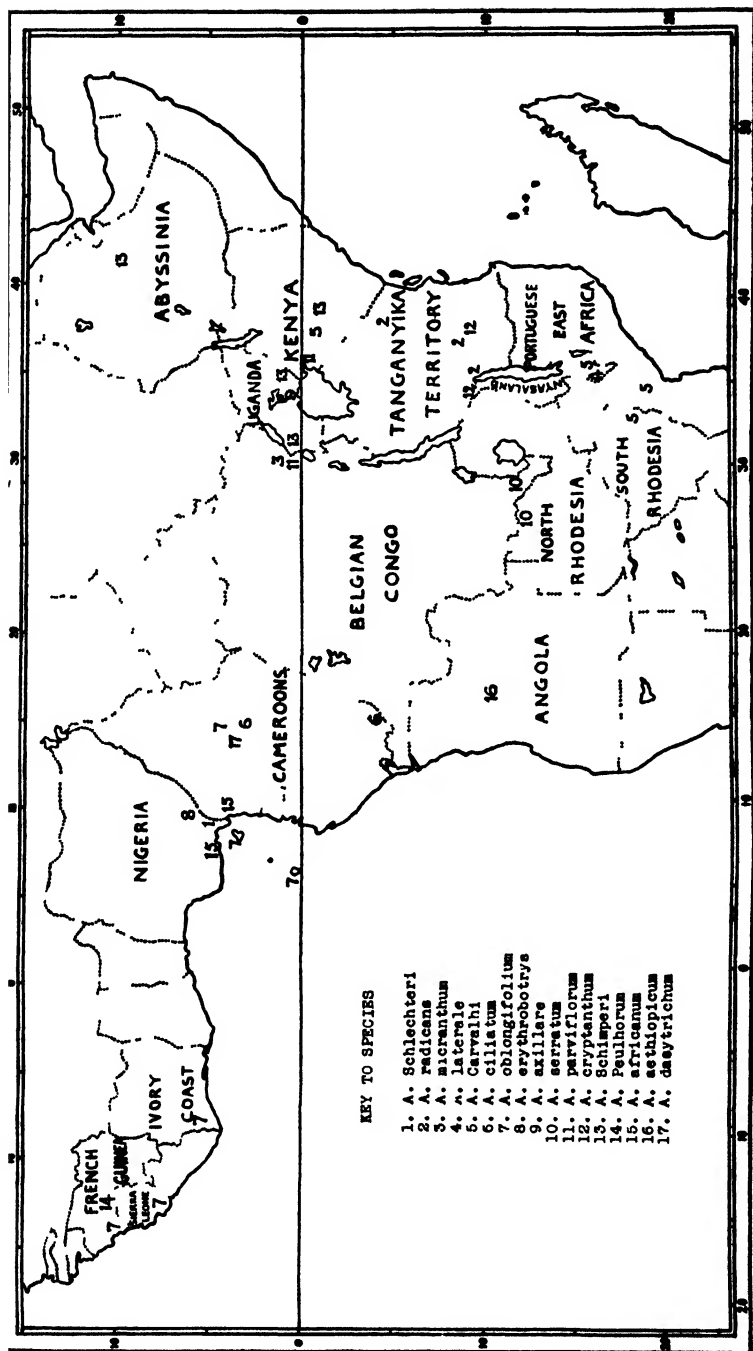


Fig. 1. Geographical range of *Achyrospermum*.

<sup>(10)</sup> The whole of Ruwenzori has been included in East Africa for convenience.





species, which has the large exserted, incurved corolla of *Colquhounia*. Both genera have appendages at the apex of the nucules.

Several species of the genus *Achyrospermum* are very closely related, and it is difficult, in some cases, to decide on the separating line, and to obtain definite key characters. Vegetative characters are chiefly used in the key as there seems to be little range in floral structure within the genus, except in the size of the lower lip of the corolla. The dentation and indumentum of the leaf, and the size, shape, indumentum and persistence of the bracts have been found to be useful and fairly constant specific characters.

In addition to the material in the Kew Herbarium, specimens have been examined at the British Museum (Natural History), and a number of specimens have been received on loan from Berlin. I am indebted to the Directors of these institutions for the facilities afforded.

#### KEY TO SPECIES.

Inflorescences lateral, usually borne on the one-year-old shoots :

Leaf-base not decurrent on the petiole ; leaves obscurely crenate, shortly petiolate (up to 1.5 cm.), narrowly elliptic, glabrous above, nerves conspicuous below, adpressed-pubescent ; inflorescences about 2 cm. long ; corolla subequal to the calyx ; stem tomentose .....**1. Schlechteri**

Leaf-base cuneate-decurrent on the petiole ; leaves distinctly toothed :

Indumentum of nerves on lower surface of leaves short and adpressed, or ascending-crisped pubescent :

Corolla long-exserted (1 cm. or more) from calyx ; inflorescences up to 4 cm. long ; calyx 5 mm. long, slightly pubescent, teeth deltoid (less than 1 mm. long) ; leaves elliptic to oblong-elliptic, closely crenate-serrate, 9-15 cm. long and 5-7 cm. broad.....**2. radicans**

Corolla subequal to or shortly exserted from the calyx ; inflorescences about 6 cm. long ; calyx 9 mm. long, teeth triangular (over 1 mm. long) ; leaves broadly elliptic, serrate, conspicuously glandular, 14-20 cm. long and 7-12 cm. broad.....**3. micranthum**

Indumentum of nerves on lower surface of leaf spreadingly pilose :

Inflorescence dense ; flowers sessile or subsessile, forming a compact oblong "spike" 3-5 cm. long, 2 cm. broad ; calyx not tapered to the base, densely pubescent ; corollas not seen.....**4. laterale**

Inflorescence loose, 3-7 cm. long, 2 cm. broad ; flowers with pedicels up to 5 mm. long ; calyx thinly pubescent, narrowed to the base ; corolla exserted by 1.5 cm.....

**5. Carvalhi**

Inflorescences terminal or terminal and axillary, borne on the new season's shoots :

**Calyx-teeth long-acuminate or caudate, 3 mm. long, densely long-ciliate ; tube adpressed-pubescent and glandular ; leaves elliptic to narrowly obovate, shortly petiolate, rounded or subacute at the base, never decurrent on the petiole, densely glandular below with short adpressed pubescence on the nerves .....6. ciliatum**

**Calyx-teeth neither long-acuminate nor caudate, generally deltoid or lanceolate :**

**Indumentum of nerves on lower surface of leaves adpressed or crispate or closely ascending-pubescent :**

**Leaves triangular-subacute at the apex, gradually narrowed to the base, not decurrent on the petiole, obscurely crenate, obovate-elliptic, 6-18 cm. long, 4-6 cm. broad ; petiole 1-2.5 cm. long ; inflorescences generally short and comparatively broad, 3-5.5 cm. long, 2 cm. broad ; calyx about 1 cm. long, lobes lanceolate, acute, 3 mm. long ; bracts broadly ovate, pubescent, early deciduous**

**.....7. oblongifolium**

**Leaves acuminate, decurrent on the petiole at the base, conspicuously serrate or dentate, elliptic or ovate-elliptic ; petiole 2-7 cm. long ; inflorescences terminal and axillary, former 5-12 cm. long, 1.5 cm. broad :**

**Bracts large (7-9 mm. long, 5-7 mm. broad), conspicuous, ovate or ovate-orbicular, shortly cuspidate, enclosing the verticils :**

**Leaves large, coarsely serrate-dentate, conspicuously decurrent on the petiole ; bracts ovate, 8 mm. long, 6 mm. broad, thinly puberulous, abruptly acuminate .....16. aethiopicum**

**Leaves not coarsely serrate :**

**Bracts and calyx conspicuously purple-tinged, the former papery, thinly pubescent ; corolla definitely exserted from the calyx (by 6 mm.), rose-violet ; leaves small, elliptic or narrowly elliptic, 6-9 cm. long, 2-4 cm. broad, closely serrate ; Nigerian species .....8. erythrobotrys**

**Bracts and calyx not or only slightly purple-tinged :**

**Bracts softly and densely pubescent with very short hairs ; corolla scarcely exserted from the calyx (by 2 mm.) ; axillary inflorescences very numerous ; leaves comparatively large, 10-20 cm. long, 5-7 cm. broad, crenate-serrate ; Uganda species .....9. axillare**

**Bracts pubescent only on the margin with fairly long hairs ..... 13. Schimperii**

**Bracts small (5 mm. long, 3.5 mm. broad), inconspicuous, ovate, gradually acuminate or long-cuspidate, not enclosing the verticils :**

- Bracts thinly adpressed-pubescent ; calyx-tube densely pubescent ; corolla white, subequal to calyx ; leaves large, elliptic or oblong-elliptic, 15-20 cm. long, 6-8 cm. broad, coarsely serrate-dentate ; axillary inflorescences many..... **10. serratum**
- Bracts glabrous or nearly so, only ciliate on the margin ; calyx-tube thinly pubescent, glandular ; corolla pubescent, pink, shortly exserted (by 3 mm.) ; leaves comparatively small, ovate or elliptic, 7-10 cm. long, 3-7 cm. broad, serrate ; axillary inflorescences few ..... **11. parviflorum**
- Indumentum** of nerves on lower surface of leaf spreadingly pilose, not adpressed or closely ascending :
- Corolla** with a large lower lip spreading at right angles to the tube, about 5 mm. long ; calyx puberulous and glandular, about 8 mm. long ; bracts broadly ovate-orbicular, about 1 cm. long and broad, cuspidate, glandular, thinly strigulose at the apex, otherwise glabrous ; inflorescence 5-14 cm. long, 2-2.5 cm. broad ; leaves ovate, 4-9 cm. long, 3.5-5 cm. broad, pilose, crenate-serrate ..... **12. cryptanthum**
- Corolla** with a small lower lip not more than 3 mm. long :
- Inflorescence** dense (about 2 cm. broad), the axis invisible between the verticils ; bracts at least 6 mm. long ; leaves sharply serrate or crenate-serrate, generally averaging 10 cm. long and 6 cm. broad :
- Bracts orbicular or oblate, as broad or broader than long :
- Bracts glabrous, except the ciliate margin, about 6 mm. long, 7 mm. broad, cuspidate, very conspicuous ; calyx villous, about 8 mm. long, teeth 1.5 mm. long ; inflorescence compact, 4-9 cm. long, 2 cm. broad ; leaves ovate, 7-11 cm. long, 4-6 cm. broad... **13. Schimperii**
- Bracts densely hirsute, about 6 mm. long and broad ; calyx small, 5 mm. long, densely pilose, teeth shortly dentate ; leaves large, 15 cm. long, 8 cm. broad, ovate, acuminate, narrowly decurrent, densely setose-pilose..... **14. Peulhorum**
- Bracts ovate, longer than broad :
- Leaves crenate-serrate, ovate, 6-8 cm. broad, 10-14 cm. long, setose-pilose ; bracts inconspicuous, early deciduous, about 8 mm. long, 5 mm. broad, pubescent ; axillary inflorescences few ; West African species..... **15. africanum**
- Leaves coarsely serrate-dentate, elliptic, 15 cm. long, 8 cm. broad, glabrescent above ; bracts conspicuous, puberulous, 1 cm. long and 6 mm. broad, abruptly acuminate, imbricate ; axillary

inflorescences several; Angolan species.....

**16. aethiopicum**

Inflorescence lax, the axis visible between the verticils; bracts small, inconspicuous, ovate-orbicular, 3 mm. long and broad; calyx 4 mm. long; both densely pilose; leaves small, ovate, 5–7 cm. long, 3–4.5 cm. broad, obtusely crenate, densely setose-pilose, triangular-acute at the apex, cuneate at the base.....

**17. dasytrichum**

ENUMERATION

**1. Achyrospermum Schlechteri** *Gürke* in Schlechter, Westafr. Kautsch. Exped. 311 (1900) partim, nomen, et in Engl. Bot. Jahrb. 36, 127 (1905); Perk. in Notizbl. Bot. Gart. Berlin, 8, 82 (1921).

CAMEROONS MT. Ncar Muëa, 2600 ft., *Schlechter* 12850 (type).

**2. A. radicans** *Gürke* in Engl. Pfl. Ost.-Afr. C, 343 (1895); Baker in Dyer, Fl. Trop. Afr. 5, 464 (1900); Perk. l.c. 78.

TANGANYIKA TERRITORY. Usambara; Lutindi, *Gürke* 3294 (type); Gonja, *Gürke* 4219; Nyasa Highlands; Kyimbila, about 5000 ft., *Stolz* 2034.

Var. **grandibracteatum** var. nov. a forma typica bracteis conspicuis 8 mm. longis 6 mm. latis ovatis acuminatis leviter pilosis, inflorescentiis brevibus differt.

TANGANYIKA TERRITORY. Mahenge, near Sali, about 3500 ft., shrub 9–12 ft. high, *H. J. Schlieben* 2259 (type).

**3. A. micranthum** *Perk.* in Mildbr. Wiss. Erg. Deutsch. Zent-Afr.-Exped. 1907–08, 2, 552 (1913).

BELGIAN CONGO. Ruwenzori West; Butagu-Tal, 5600–6800 ft., *Mildbraed* 2700 (type).

**4. A. laterale** *Baker* in Dyer, Fl. Trop. Afr. 5, 464 (1900); Perk. l.c. 79.

*Descr. emend.* *Suffrutex* subscandens, ramis pubescentibus apicem versus densioribus. *Folia* longe petiolata, petiolis 4–8 cm. longis pubescentibus; laminae membranaceae, ellipticae, basi sensim et anguste cuneatae in petiolos decurrentes, apice acuminatae, 12–15 cm. longae, 4–7 cm. latae, subtus pilis patulis leviter vestitae, supra peraxe pilosae, margine crenato-serrato, nervis lateralibus utrinsecus circiter 8 ascendentibus. *Inflorescentiae* axillares, densae, sessiles, oblongae, 3–5 cm. longae, e ramis vetustioribus ortae, floribus breviter pedicellatis. *Bractaeae* late ovatae, acuminatae, pubescentes, 5 mm. longae et latae, mox deciduae. *Calyx* subcylindricus, 5-dentatus (fructu 7 mm. longus), pubescens, apicem versus pilis longis vestitus, dentibus deltoideis 1 mm. longis. *Corolla* rubra vel purpurea (non visa). *Nuculae* apice paleis membranaceis comosae.

NYASALAND. Shiré Highlands; near Blantyre, on top of Wirandi, *Buchanan* 98 (type) ; N'Chisi Mt., rain forest, in thickets, flowers purplish, *Burt Davy* 1294.

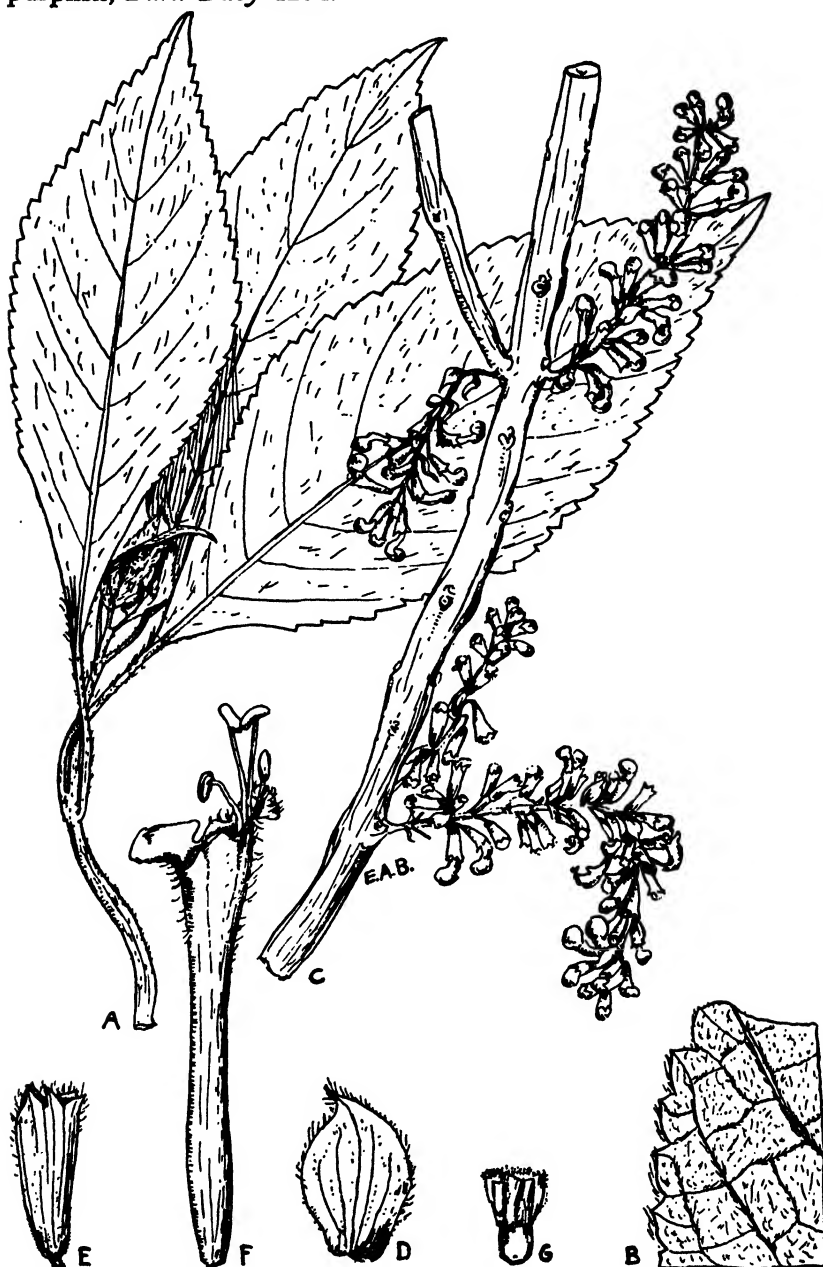


Fig. 3. *Achyrospermum Carvalhi* Gurke. A, young leafy shoot ( $\times \frac{1}{2}$ ); B, under-surface of leaf ( $\times 2$ ); C, leafless flowering branch ( $\times \frac{1}{2}$ ); D, bract ( $\times 3$ ); E, calyx ( $\times 3$ ); F, corolla ( $\times 3$ ); G, young nutlet ( $\times 12$ ).

**5. *A. Carvalhoi* Gürke** in Engl. Pfl. Ost.-Afr. C, 343 (1895) ; Baker l.c. 464 ; Perk. l.c. 78.

KENYA COLONY. S. Kenya forest, 6000–7000 ft., shrub 6–12 ft., corolla red, *Battiscombe* 694 ; S. W. Kenya, 7000 ft. in forest, not in dense shade, handsome shrub 4–5 ft., corolla bright-pink, *Battiscombe* 1168 ; Mt. Kenya, east slope, Rogati river, 6000–7000 ft., *A. B. Rendle* 592.

NYASALAND. Namasi, *Cameron* s.n.

PORTUGUESE EAST AFRICA. Gorungosa, *Carvalho* (type).

S. RHODESIA. Chirinda Forest, 3700–4000 ft., in forest undergrowth, large shrub with bright-red flowers, *Swynnerton* 78.

**6. *A. ciliatum* Gürke** in Engl. Bot. Jahrb. 36, 128 (1905) ; Perk. l.c. 82. *A. Schlechteri* Gürke in Schlechter, Westafr. Kautsch.-Exped. 311 (1900) partim, nomen.

*Descr. emend.* *Herba vel suffrutex*, ramis pilosis. *Folia* petiolata, petiolis 1–3 cm. longis pilis adpressis puberulis et paucis patulis obtectis ; laminae membranaceae, obovatae vel ellipticae, basi late cuneatae vel rotundatae, apice acutae vel breviter acuminae, 10–20 cm. longae, 5–9 cm. latae, subtus glandulosae, nervis leviter adpresse pubescentibus aliter glabrae, supra pilis paucis obtectae, margine nonnunquam obscure ciliato-crenato, nervis lateralibus utrinsecus circiter 7. *Inflorescentiae* terminales et axillares, interdum 6–7 cm. longae, pedunculatae, floribus subsessilibus. *Bractae* ovatae, pubescentes, mox deciduae. *Calyx* subcylindricus, circiter 7 mm. longus, adpresse pubescens, haud nervosus, apice ciliatus, 5-dentatus, dentibus deltoideis caudatis 2–3 mm. longis. *Corolla* non visa.

CAMEROONS. Dja Fluss, *Schlechter* 12769 (type).

BELGIAN CONGO. Kimuenza, 17 Km. south of Leopoldville, in shady marginal forest, *Mildbraed* 3733.

**7. *A. oblongifolium* Baker** in Dyer, Fl. Trop. Afr. 5, 464 (1900) ; Hutch. & Dalz. Fl. West Trop. Afr. 2, 279 (1931) ; Perk. l.c. 79. *Ocimum Sassandrae* A. Chev. Expl. Bot. Afr. Occid. Franç. 512 (1920) *nomen*. *A. densiflorum* Perk. in Notizbl. Bot. Gart. Berlin, 8, 82, non Blume.

*Descr. emend.* *Herba* perennis vel *suffrutex*, ramis erectis tomentosis. *Folia* petiolata, petiolis 1–2 cm. longis tomentosis ; laminae membranaceae, obovato-ellipticae, basi cuneatae, apice triangulari-subacutae, 6–18 cm. longae, usque ad 8 cm. latae, subtus nervis adpresse puberulis aliter glabrae, supra glabrescentes, margine superne obscure crenato, nervis lateralibus utrinsecus 7. *Inflorescentia* terminalis, oblonga, densa, subsessilis, 3–6 cm. longa, 2 cm. diametro, floribus subsessilibus. *Bractae* late ovatae, pubescentes, mox deciduae. *Calyx* subcylindricus, 5-dentatus, circiter 10-nervus, pubescens, glanduloso-punctatus, tubo 6 cm. longo, dentibus subaequalibus late triangularibus 3 mm. longis ciliatis. *Corolla* flavo-alba, bilabiata, calyce subaequalis, tubo cylindrico

circiter 5 mm. longo, labio postico brevissime 2-fido rotundato, antico longiore 3-fido, lobis rotundatis medio majore.

FRENCH GUINEA. Konianké country between Fassakoidou and Kesseridou, *Chevalier* 2081; Guéré country, Boola Mts., on Mt. Ntongon 3150 ft., *Chevalier* 20926.

SIERRA LEONE. Kennema, *Thomas* 7572, 7629; Mamaha, *Thomas* 4578.

IVORY COAST. Middle Sassandra and Middle Cavally, in forest clearings, *Chevalier* 19244.

FERNANDO PO. *Barter* 1697 (type).

ST. THOMAS ISLAND. Angolares, Praia grande, 300 ft., *Quintas* 69; 1025.

CAMEROONS. Bitye, Yaunde, small undershrub, flowers white, *Bates* 1060; 1436.

PORTUGUESE CONGO. Maiombe; Rio Lufo, an annual herb 1½ ft. high, flowers white, in thickets, *Gossweiler* 7916.

8. *A. erythrobotrys* *Perk.* in Notizbl. Bot. Gart. Berlin, 8, 80 (1921).

S. NIGERIA. Bambuttu Mts.; Markt Singwa, 6500–8000 ft., in grass savannah, 3–5 ft. high, flowers rose, *Ledermann* 1659 (type); in open mountain scrub 6500 ft., very common, *Ledermann* 1696.

9. *A. axillare* *E. A. Bruce*, sp. nov.; affinis *A. parvifloro* S. Moore, sed bracteis majoribus dense pubescentibus, inflorescentiis axillari-bus numerosis differt.

*Suffrutex* circiter 1.3 m. altus, nonnunquam subscandens, ramis subteretibus striatis puberulis, internodiis 5–12 cm. longis, ramulis lateralibus plantae apicem versus brevibus basin versus longioribus inflorescentiis coronatis. *Folia* petiolata, petiolis 1–5 cm. longis canaliculatis; laminae membranaceae, ellipticae vel oblongo-ellipticae, basi cuneatae in petiolos abrupte decurrentes, apice acutae, 9–20 cm. longae, 4–8 cm. latae, subtus nervis adpresse pubescentibus, supra pilis paucis vel glabrescentes, margine crenato vel crenato-serrato, nervis lateralibus utrinsecus 6–8 ascendentibus. *Inflorescentiae* plurimae, elongatae, spicatae, breviter pedunculatae, terminales et ramos laterales in axillis foliorum terminatae, 4–10 cm. longae, 1.5 cm. diametro. *Bractee* conspicuae, imbricatae, ovato-orbiculatae, apice abrupte apiculatae, basi rotundatae, usque 9 mm. longae et latae, leviter nervosae, pubescentes, margine ciliato. *Calyx* subcylindricus, 5-dentatus, villosus, tubo 5 mm. longo, dentibus deltoideis acutis 2 mm. longis. *Corolla* alba, bilabiata, e calyce leviter exserta, tubo cylindrico 5 mm. longo leviter pubescente basin versus glabro, labio postico 1 mm. longo erecto bifido oblongo apice obtuso, labio antico 3-fido patente intermedio majore late orbiculare, omnibus extra pilosis. *Stamina* 4, exserta, arcuata.

UGANDA. Luzira, near Kampala, *Liebenberg* 772 (type); Mawokota, 3900 ft., *Brown* 207; Entebbe, 3900 ft., *Brown* 352; Kigude, 4000 ft., on forest path 4 ft. high, flowers whitish, *Dümmer* 2671, 2671A.



Fig. 4. *Achyrospermum axillare* E. A. Bruce. A, flowering shoot ( $\times \frac{1}{2}$ ); B, under-surface of leaf ( $\times \frac{1}{2}$ ); C, corolla ( $\times 3$ ); D, bract ( $\times 3$ ); E, style and ovary ( $\times 3$ ); F, calyx ( $\times 3$ ); G, nutlet ( $\times 6$ ).



**10. *A. serratum*** E. A. Bruce, sp. nov.; affinis *A. aethiopico* Welw., sed bracteis minoribus inconspicuis differt.

*Herba* perennis, circiter 1 m. alta, ramis leviter pubescentibus demum glabrescentibus. *Folia* magna, longissime petiolata, petiolis 3–8 cm. longis sparse pubescentibus; laminae membranaceae, anguste ellipticae vel ovato-ellipticae, basi cuneatae et in petiolos decurrentes, apice longe acuminatae, 14–18 cm. longae, 6–8 cm. latae, subtus glanduloso-punctatae, costis leviter adscendentibus pubescentibus aliter glabrae, supra costa media excepta glaberrimae, margine profunde dentato-serrato, nervis lateralibus utrinsecus circiter 6 adscendentibus arcuatis. *Inflorescentiae* terminales et axillares, anguste oblongae, densissimae; terminalis sessilis, 6–9 cm. longa, 1.5 cm. diametro; axillaris pedunculata, 1.5–5.0 cm. longa, floribus sessilibus. *Bractae* mox deciduae, ovatae, acuminatae, pubescentes, 5 mm. longae, margine ciliato. *Calyx* subcylindricus, 5-dentatus, molliter pubescens et glanduloso-punctatus, tubo 4 mm. longo, dentibus subaequalibus triangulari-lanceolatis 2–3 mm. longis pilosis. *Corolla* alba, bilabiata, calyce subaequalis, tubo cylindrico 6 mm. longo apice hirsuto infra glabro, labio postico erecto bifido, labio antico longiore 3-fido intermedio majore, omnibus rotundatis. *Stamina* 4, leviter exserta, arcuata.

BELGIAN CONGO. Elisabethville, about 4000 ft., Rogers 26251.

N. RHODESIA. Solwezi distr.; R. Nyabisonga, among ever-green vegetation by the river in dense shade of trees and shrubs in ground full of humus, Milne-Redhead 799 (type).

**11. *A. parviflorum*** S. Moore in Journ. Bot. 45, 97 (1907); Perk. l.c. 80. *A. Mildbraedii* Perk. in Wiss. Erg. Deutsch. Zent.-Afr. Exped. 1907–08, 553 (1913).

BELGIAN CONGO. Fort Beni, Muera, flowers purple-rose, Mildbraed 2296.

UGANDA. Budongo Forest, Unyoro, Bagshawe 927 (type); near Fort Portal, 4500 ft., Bagshawe 1264; 3600 ft., undergrowth in forest, 4 ft. high, flowers pink, Eggeling 1410; near Wantuluntu, 4000 ft., Dümmer 3043; Mabira Forest, Mulange, 4000 ft., forest-path, 3 ft. high, Dümmer 4498, 5603; near Mubango, 4000 ft., Dümmer 1385; Mabira, Snowden 230; Maitland 1282.

KENYA. N. Kavirondo, 5000 ft., climber in forest with spikes of white flowers, Mrs. C. Jack 148.

**12. *A. cryptanthum*** Baker in Kew Bull. 162 (1898), et in Dyer, Fl. Trop. Afr. 5, 464 (1900). *A. nyasanum* Baker l.c. 456. *A. Schimperi* Perk. l.c. 79, pro parte. *A. swina* Perk. l.c. 80.

TANGANYIKA TERRITORY. Iringa District; East Mufindi, 6200 ft., a pink-flowered shrub up to 6 ft. high, more or less branched, in secondary *Myrica-Macaranga-Gymnosporia* mist forest, Greenway 3465; Kyimbila, Stolz 2106. Mts. E. of Lake Nyasa, Rev. Johnson.

NYASALAND. Masuka Plateau, 6500–7000 ft., Whyte s.n. (type).

**13. A. Schimper** (*Hochst. ex Briq.*) *Perk.* in Notizbl. Bot. Gart. Berlin, **8**, 79 (1921), pro parte. *Elsholtzia Schimper* Hochst. in Schimp. Pl. Abyss. Exsicc. Nr. 1411, nomen; Vatke in Linnaea, **37**, 325 (1873) nomen; Engl. in Hochgebirgsfl. Trop. Afr. **363** (1892) nomen; Briq. in Bull. Herb. Boiss. **2**, 133 (1894); Gürke in Schlechter, Westafr. Kautsch. Exped. **311** (1900); Baker in Dyer, Fl. Trop. Afr. **5**, 451 (1900). *A. Mearnsii* Standley in Smithson. Misc. Coll. **68**, no. **5**; **13** (1917).

ABYSSINIA. *Schimper* 694, 1411 (type); Addi-Aburi, 6500 ft., *Schimper* 755; between Harrar and Addis Ababa, *Wellby* s.n.; between Djem-Djem and Wouramboulchi, 8500–9000 ft., *Omer Cooper* s.n.

UGANDA. Ruwenzori; Musandama, 7000 ft., on edge of forest, flowers lilac or blue, *Maitland* 1061; Bugishu, Bufumbo, 4000–5000 ft., 4–5 ft. high, flowers deep pink, *Chandler* 1000; Toro, *Fyffe* 71; Mt. Elgon, 6000 ft., near Namatala River, flowers purple, *Snowden* 534; Bulago, 6500 ft., suffruticose 2–3 ft., *Snowden* 1017; near Butarrhiga, 7000 ft., *Dümmer* 3690.

KENYA. Aberdare Mts., 7000 ft., *Mainwaring* s.n.; near Nandi, *Whyte* s.n.; Katamayu, 8000 ft., on river-bank at forest-edge, *Napier* 2715; Limoru, 7000 ft., *van Someren* 253; Limoru, riparian swamp, *Dümmer* 1624. Mt. Kenya, west slopes, in the giant heath zone, about 11800 ft., *Mearns* 1321; 1343.

**14. A. Peulhorum** (*A. Chev.*) *E. A. Bruce*, comb. nov. *Ocimum Peulhorum* A. Chev. in Expl. Bot. Afr. Occid. Franç. **512** (1920). *A. africanum* Hutch. & Dalz. Fl. West Trop. Afr. **2**, 279, pro parte.

*Herba* perennis, ramis lignosis hirsutis. *Folia* petiolis circiter 5 cm. longis hirsutis; laminae ovatae, basi cuneatae et anguste decurrentes, apice acuminatae, circiter 15 cm. longae, 8 cm. latae, subtus dense patente supra leviter setoso-pilosae, nervis lateralibus utrinsecus 6. *Inflorescentiae* terminales et axillares, densae, 3–8 cm. longae. *Bracteae* dense hirsutae, circiter 6 mm. longae et latae. *Calyx* subcylindricus, 5 mm. longus, dense pilosus, dentibus breviter triangularibus. *Corolla* e calyce leviter exserta.

FRENCH GUINEA. Between Dalaba and Mamow, *Chev.* 20347 (type).

**15. A. africanum** *Hook. f.* ex *Baker* in Dyer, Fl. Trop. Afr. **5**, 465 (1900); Hutch. & Dalz. Fl. West Trop. Afr. **2**, 279 (1931), pro parte. *A. Schimper* *Perk.* l.c. 79, pro parte.

CAMEROONS MT.: 2000 ft., *Mann* 1297 (type); 2500 ft., *Mann* 1949; Victoria, 3000 ft., *Kalbreyer* 99; Buea, 3000 ft., *Dunlap* 151.

CAMEROONS. Between Mafura and Mundame, 1000 ft., *Schlechter* 12914; Abonando, *Rudatis*.

**16. A. aethiopicum** *Welw.* in Trans. Linn. Soc. **27**, 56 (1869); Baker in Dyer, Fl. Trop. Afr. **5**, 465 (1900). *A. Schimper* *Perk.* l.c. 79, pro parte.

ANGOLA. Pungo Andongo, 2400–3800 ft., in shady forest at a cataract in the rocky Calundo valley, sporadic and rather rare, *Welwitsch* 1633 (type).

17. *A. dasytrichum* *Perk.* in Notizbl. Bot. Gart. Berlin, 8, 81 (1921).

CAMEROONS. Jaunde Station, *Zenker* 322 (type).

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## VII—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS. KEW : XVII.\*

The following lists comprise records of species new to the Gardens and (in the list of birds) a few notes on species already recorded in this series. We are much indebted to the correspondents and members of the staff who have made these observations. The Director would be grateful for further records for incorporation in future lists.

The abbreviations of localities are as follows :—A=Arboretum, Q=Queen's Cottage Grounds, and R=Rock Garden.

The initials of the contributors, where known, follow each record. The following is a list of contributors.

Aikman, Mr. J.	Mason, Mr. E. W.
Burt, Mr. B. L.	Mingay, Mr. J. A.
Claiden, Mr. J.	Moon, Mr. A.
Collenette, Mr. C. L.	Ridley, Mr. H. N.
Dallimore, Mr. W.	Robinson, Mr. C. J.
Ehrlich, Dr. J.	Turrill, Dr. W. B.
Hall, Miss K.	White, Dr. E. I.
Hill, Sir. A. W.	Wiltshire, Mrs. V. G.
Latham, Mr. A. H.	

### MAMMALS

\**Meles meles* *L.* "Badger." One specimen lived in Q. 1912–1913. Early in 1913, owing to the damage it did to the ornamental wild fowl, it was dug up and set free in Essex. Judging by the size of its earth it must have lived there for some months. For a full account and photograph, see *Journal of the Kew Guild*, 1915, 217.

### BIRDS

(In alphabetical order of English names)

Owing to increased building activities and consequent lack of suitable habitats in the neighbourhood, our wild birds have considerably decreased since Hudson wrote his account in 1906. Mr. Robinson has noted 61 different species during the last fourteen years, whereas Hudson's list contained 84 species. Nevertheless the

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\* Continued from K.B. 1922, 193. See also K.B. 1934, 138.

following list records some fifteen birds not in Hudson's list ; these are marked with an asterisk. In addition there are notes on previously recorded species.

**\*Bittern.** *Botaurus stellaris* (L.) Found entangled in a bush in Q, Dec. 1921. Sent to the Zoo (A.W.H.).

**Blackbird.** *Turdus merula* L. (1) Variegated forms are common, some years more so than others. One with a white ring round its neck, resembling a ring-ouzel, was seen for some years in the *Rosaceae* collection ; others had white spots on shoulders and wings. A pure white one with a black feather or two in its tail and some black on the belly was seen in 1915 (H.N.R.). A pure white one, except for one grey feather in the tail is to be seen in Q. (J.C.).

**Brambling.** *Fringilla montifringilla* L. One pair, March 15, 1934. (A.M.)

**Brown (or Tawny) Owl.** *Stryx aluco* L. I have seen this owl in A. in the daytime, pursued by other birds ; and I have heard it hooting at 11 a.m. in Q. (H.N.R.).

**\*Buzzard.** *Buteo buteo* (L.). Seen flying over the Gardens, 1935 (H.N.R. & J.C.).

**Chaffinch.** *Fringilla coelebs* L. Hardly local, as Hudson states. It is all over the Gardens and flocks (chiefly females together) in winter in A. near the Nursery (H.N.R.).

**Coal Tit.** *Parus ater* L. C.J.R.†

**\*Cormorant.** *Phalacrocorax carbo* (L.). (1) Flying eastwards over the Gardens, about 300 ft. up, Aug. 30, 1935, and Sept. 1, 1935 (C.L.C.).

**\*Crossbill.** *Loxia curvirostra* L. One specimen seen in pines by the lake, Feb. 9, 1936 (E.I.W.). Later several others seen, one pair nesting.

**Fieldfare.** *Turdus pilaris* L. C.J.R.

**Garden Warbler.** *Sylvia borin* (Bodd.). C.J.R.

**Golden-crested Wren.** *Regulus regulus* (L.). C.J.R.

**\*Golden Oriole.** *Oriolus oriolus* (L.). (1) A male specimen seen on the wing, Aug. 21, 1934 (C.J.R.). (2) Sept., 1934, on two occasions (K.H. & J.C.).

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† C.J.R. alone means that Mr. Robinson noticed the species between 1922 and 1936.

**\*Great Black-backed Gull.** *Larus marinus* L. Often seen on the river opposite Syon House. On the pond, winter 1935-36 (H.N.R.).

**\*Great Crested Grebe.** *Podiceps cristatus* L. This species was seen on the river opposite Syon House, Jan., 1931 (H.N.R.).

**\*Great Spotted Woodpecker.** *Dryobates major* (L.). (1) First seen March, 1924, near Pagoda. A pair have lived, and I think, bred, in Q. since 1930 (H.N.R.). (2) July, 1934 and April, 1935 (C.J.R.).

**\*Grey Wagtail.** *Motacilla cinerea* Tunst. (1) Gambolling on the edge of the lake, April, 1927 (C.J.R.). (2) Two specimens on waterlilies at west end of lake, Oct. 5, 1933 (H.N.R.).

**Hawfinch.** *Coccothraustes coccothraustes* (L.). (1) Five seen for several days feeding on *Ilex laevigata*, Oct., 1925 (H.N.R.). (2) C.J.R.

**Large Hawk or Falcon.** A large falcon has visited the Gardens almost every year since 1929. In autumn, when the wood pigeons are abundant, I have constantly found remains killed by it and one pellet containing a whole pigeons' leg. After vainly trying to locate it, in 1932 I saw a large falcon soaring in circles at a great height over Syon Vista, and in 1935 a pair circling over the Palace Lawn at 100 ft. They appeared to be Goshawks rather than Peregrine Falcons, being dark-grey or brown with white spotted tail feathers and blunt wings (H.N.R.).

**House Sparrow.** *Passer domesticus* (L.). A white specimen in Q., 1926-1935 (J.C.).

**Kingfisher.** *Alcedo ispida* L. Still frequent in the autumn by water in various parts of the Gardens (J.C.).

**Lesser Spotted Woodpecker.** *Dryobates minor* (L.). This species seems now to be rare. I have seen it, and Mr. Hankey saw one in September, 1934, near the Heath beds (H.N.R.). Weeping Ash by Herbarium, Dec. 28, 1934 (B.L.B.).

**Long-Tailed Tit.** *Aegithalos caudatus* (L.). C.J.R.

**Magpie.** *Pica pica* (L.). One specimen in the Iris Garden, March, 1929 (H.N.R.).

**Marsh Titmouse.** *Parus palustris* Stejn. (1) A regular inhabitant, commonly seen in winter and early spring. I believe it nests on the mound by the pond and in beech trees in A. (H.N.R.) (2) C.J.R.

**Nuthatch.** *Sitta europaea* Blyth. C.J.R.

**\*Peewit.** *Vanellus vanellus* (L.). (1) Frequently seen flying over from the Chiswick fields to Richmond (H.N.R.). (2) March, 1929 (C.J.R.).

**Red-backed Shrike.** *Lanius collurio* L. June, 1927 (C.J.R.).

**\*Redwing.** *Turdus musicus* L. (1) Comes in flocks almost every year when it is cold enough, e.g. winter 1933-1934. It feeds on Siberian crab, and has been seen catching insects by the lake and bathing in puddles (H.N.R.). (2) February, 1929, with fieldfares (C.J.R.). (2) February, 1936 (B.L.B.).

**Robin.** *Erythacus rubecula* (L.). Variegated forms: one with a snow-white cap near Queen's Cottage, 1925, and one with white stripes above and below the eyes and a white collar, near the Palm House, 1933 (H.N.R.).

**\*Sand Martin.** *Riparia riparia* (L.). (1) Seen flying over the pond with house martins, October 7, 1911 (K.B. 1911, 365). (2) Comes every year flying over the pond in spring and autumn. The first of the group to come and the last to go (H.N.R.).

**Sandpiper** (species not certain). C.J.R.

**\*Shag.** *Phalacrocorax aristotelis* (L.) Usually seen in the early morning by the side of the lake and in the daytime on the river between Isleworth Gate and Kew Bridge, 1931-36 (H.N.R. & J.C.).

**Skylark.** *Alauda arvensis* (L.). One specimen near the Wellingtonias, in heavy snow, Jan. 14, 1929 (H.N.R.).

**\*Snipe.** *Capella gallinago* (L.). (1) A specimen flying over Gardens from Syon House, June, 1927 (C.J.R.). (2) In April, 1934, one specimen was seen at the southern end of the Gardens (J.C.).

**Sparrowhawk.** *Accipiter nisus* (L.). (1) Specimen seen above the lake August 30, 1935 (C.L.C.). (2) Frequently seen (J.C. and H.N.R.).

**Spotted Flycatcher.** *Musicapa striata* (Pall.). Sometimes never seen for a whole season: sometimes abundant (i.e. about 12 years ago). Seen summer, 1935 (C.J.R.).

**Swift.** *Micropus apus* (L.). Seen on April 16, 1935 (C.J.R.).

**\*Tree Sparrow.** *Passer montanus* (L.). Two seen by the water tower some years ago (H.N.R. 1934).

**\*Wheatear.** *Oenanthe oenanthe* (L.). One female seen on passage near Palm House, 1933 (H.N.R.).

**Willow Warbler or Wren.** *Phylloscopus trochilus* (L.). C.J.R.

**Wood Warbler or Wren.** *Phylloscopus sibilatrix* (Bechst.). Still haunts the trees near the Heaths (H.N.R.).

**Wryneck.** *Lynx torquilla* L. (1) C.J.R. (2) Nested one year in hole in a beech tree in Q., but next year a starling occupied the hole and the wryneck did not re-appear (H.N.R.).

### EXOTIC BIRDS

**Indian Ring-necked Parrakeet.** *Psittacula mamillensis*. Three of these birds settled in the Gardens in the autumn of 1929 and stayed all through the following summer. The species is native in India, Ceylon, Burma, and Cochin-China (J.C.).

**Macaw.** A specimen made its home in the Gardens from August to October, 1935 (J.C.).

### INSECTS

#### Coleoptera

**Phloeosinus thujae Perris.** Thuja Bark Beetle. Found again on *Thuja orientalis* var. *intermedia* in Arboretum, Feb. 8, 1936 (W.D.). See K.B. 1922, 189.

#### Hymenoptera

**Halictus minutus** (Schrank). 1924 (H.N.R.).

**Nomada goodeniana** (Kirby). 1924 (H.N.R.).

**Nomada marshamella** (Kirby). 1924 (H.N.R.).

#### Diptera

##### SYRPHIDAE

**Platychirus manicatus** Mg. Sept. 1935 (H.A.L.).

**Platychirus albimanus** Fab. Sept. 1935 (H.A.L.).

**Platychirus scutatus** Mg. Sept. 1935 (H.A.L.).

**Syrphus vitripennis** Mg. Sept. 1935 (H.A.L.).

**Syrphus luniger** Mg. Sept. 1935 (H.A.L.).

**Syrphus bulteatus** De G. Sept. 1935 (H.A.L.).

**Sphaerophoris scripta** L. Sept. 1935 (H.A.L.).

**Eristalis tenax** L. Sept. 1935 (H.A.L.).

**Eristalis nemorum** L. Sept. 1935 (H.A.L.).

**Zylota segnis** L. Sept. 1935 (H.A.L.).

## MUSCIDAE

**Fannia hamata** *Mg.* 1924 (H.N.R.).

## CULICIDAE

**Theobaldia annulata** *Schrank.* 1908 (J.A.).

## Lepidoptera

**Colias croceus** (*Fourcroy*). "Clouded Yellow." Sept., 1917 (H.N.R.).

**Polyonia c-album** (*Linn.*). "Comma." One specimen by Syon Vista and one on rose beds, Sept. 1934, and one hibernated specimen by Heath Beds, March, 1935 (H.N.R.).

**Zygaena trifolii** (*Esp.*). "Five-spotted Burnet." H. June 27, 1930 (H.N.R.).

## ARACHNIDA

### ARANEIDEA

**Asagena alticeps** *Keyserling.* Found in a parcel of orchids from Venezuela, Dec., 1927.

## ANNELIDA

**Eisenia veneta** *Rosa*, var. *robusta* *Friend.* 1909 (See "Nature," Feb., 1927).

## FLOWERING PLANTS

**Veronica montana** *L.* In grassfield near Herbarium, Aug. 20, 1922 (W.B.T.).

## ALGAE

**Chaetomorpha linum** *Kütz.* Lake, Oct. 21, 1920 (J.A.M. Det. Prof. Fritsch).

## FUNGI

### Pyrenomycetes

**Anthostoma dryophilum** (*Curr.*) *Sacc.* On oak. Sept. 2, 1923 (E.W.M.).

**Anthostoma turgidum** (*Pers.*) *Nits.* On beech. Aug. & Sept. 1923 (E.W.M.).

**Cryptovalsa protracta** (*Pers.*) *Ces. & De Not.* On *Fraxinus* sp. July, 1934 (E.W.M.).

**Diatrype disciformis** (*Hoffm.*) *Fr.* On beech. Jan. & Sept., 1923 (E.W.M.).

**Diatrypella favacea** (*Fr.*) *Ces. & De Not.* On Birch Dec., 1922 & June, 1923 (E.W.M.).



**Enchnoa infernalis** (*Kunze*) *Fckl.* On oak. 1923 (E.W.M.).

**Hypoxylon serpens** (*Pers. ex Fr.*) *Fr.* On decaying bark of a dead elm branch. Oct. 18, 1934 (J.E.).

**Quaternaria quaternata** (*Pers.*) *Schroet.* On beech. Sept. 1922 & April–Sept. 1923 (E.W.M.).

### MYCETOZOA

The following species new to the Gardens were recorded by  
Mrs. V. G. Wiltshire during 1925–26.

**Physarum nutans** *Pers.* On old stump.

**P. compressum** *Alb. & Schw.* On dead grass.

**P. bitectum** *Lister.* On fallen rhododendron leaves.

**Craterium leucocephalum** *Ditm.* On dead holly leaves.

**Diderma spumaroides** *Fries.* On dead lime leaves.

**Stemonitis ferruginea** *Ehrenb.* On rotten stump.

**Comatricha typhoides** *Rost.* On rotten wood.

**C. pulchella** *Rost.* On leaves and dead grass.

**Dictydiaethalium plumbeum** *Rost.* On dead twig.

**Trichia affinis** *de Bary.* On rotten wood.

**Lachnobolus congestus** *Lister.* On fallen branch.

**Margarita metallica** *Lister.* On dead twig.

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### VIII—THE ANATOMY OF SOME LAURACEOUS SCENT-YIELDING WOODS KNOWN AS "MEDANG." B. ALWYN JAY.

Two papers on the structure of scent-yielding woods have recently been published in the Kew Bulletin (4 and 5). The present paper may be regarded as a continuation of this series, since it is concerned with the anatomy of certain scent-yielding woods of the *Lauraceae* from the Federated Malay States, where they are known collectively as "Medang." The name "Medang" is often qualified by the use of an adjective to differentiate the

species, but as these second names are not consistent throughout the range of distribution of the species, even in the locality where the specimens used in this investigation were collected, they have been omitted.

The material used consisted of numbered wood specimens, kindly supplied by Mr. H. E. Desch of the Forest Research Institute, Kepong, Federated Malay States. Their identity had been previously established from the corresponding herbarium material. During the course of the work, the herbarium material in question was sent to Kew on loan, where, after critical examination, some of the specimens were re-identified. The names used in the present paper are the ones assigned to the herbarium specimens after they had been examined at Kew. (A few specimens from the collections in the Kew museums were also examined).

The anatomical terms used in describing the woods are for the most part those defined in the Glossary recently compiled by a special committee of the International Association of Wood Anatomists (8).

The perfumery value of "Medang" is due to the presence of scent-yielding substances in specialised secretory cells in the wood. Gildemeister and Hoffmann (2) state that the oil of *Cinnamomum parthenoxylon* Meissn. consists chiefly of safrol. "Medang Loson" oil (obtained from the same species), is described in a paper in the Perfumery and Essential Oil Record (6) as being slightly inferior to safrol, but a useful, cheap substitute for it in perfuming soap. It seems probable that *C. parthenoxylon* and *C. inunctum* are the only species amongst those examined which are likely to be of value in perfumery, as these species alone were found to be strongly scented, whilst the others did not give off any appreciable odour, even when shavings of them were boiled in water. The sapwood of these species was found to be more strongly scented than the heartwood.

It is also of interest to note that no characters could be found whereby the wood of *C. parthenoxylon* could be distinguished from that of *C. inunctum*. Moreover the morphological differences between these species are small. According to Ridley (7) the leaves of *C. parthenoxylon* are glaucous, whereas those of *C. inunctum* are not. Gamble (1) makes the distinction that the axils of the leaf-nerves of *C. parthenoxylon* bear pitted glands, while those of *C. inunctum* have none. Mr. C. E. C. Fischer says that, in his opinion, these dissimilarities are hardly sufficient to differentiate these species with certainty, so that it is possible that they are identical. For these reasons *C. parthenoxylon* and *C. inunctum* have been described together. Moreover, since all the species dealt with resemble one another very strongly, the only complete description that has been drawn up is the one for these two species. Brief descriptions, including only those features which appear to be of diagnostic value, are given of the other species, thereby avoiding repetition.

The number of species examined during the course of this investigation is so small that no attempt has been made to find characters whereby the different genera may be distinguished from one another.

Most of the specimens were too small to show if the heart and sapwood are clearly defined.

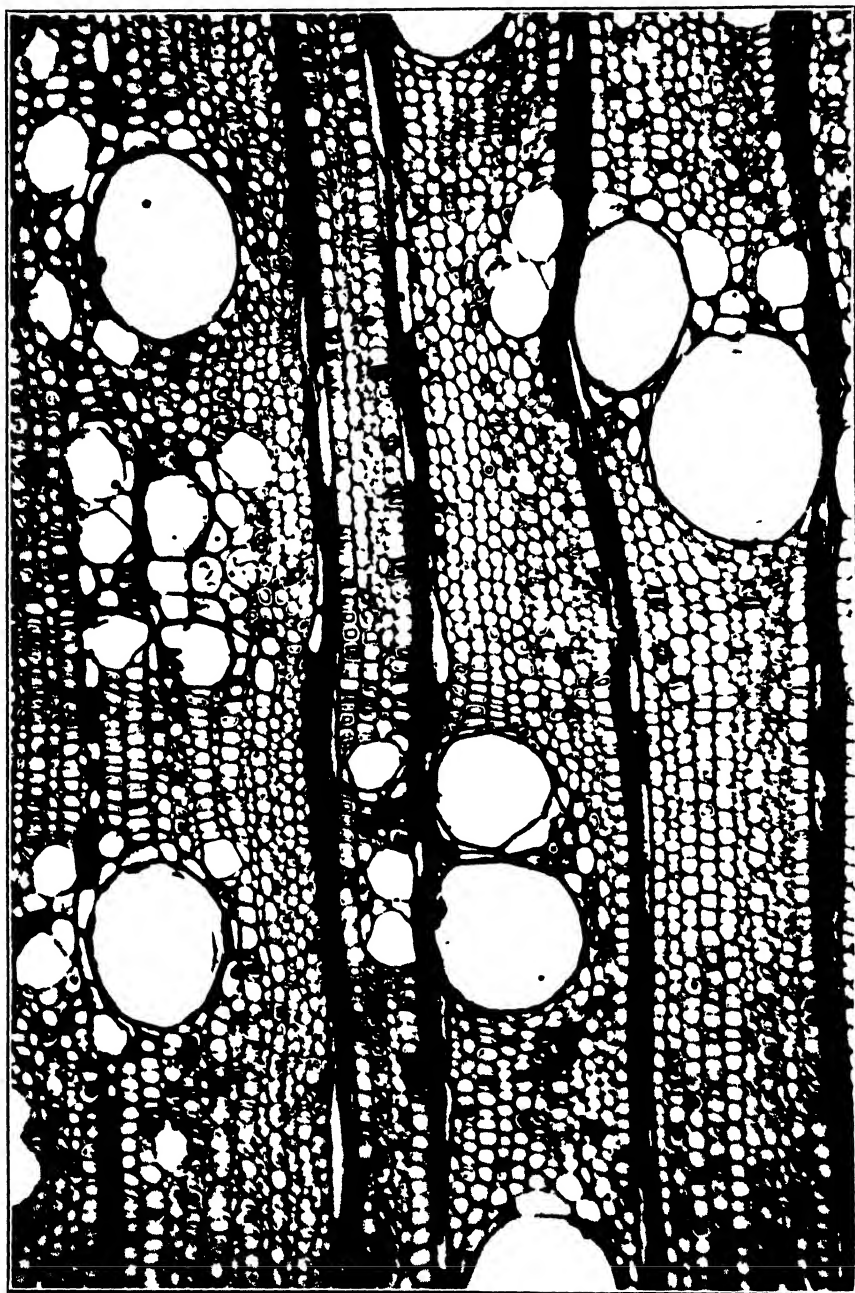
**1. *Cinnamomum parthenoxylon* Meissn. and *C. inunctum* Meissn. (Pls. II and III.)**

**GENERAL PROPERTIES AND MACROSCOPIC FEATURES.**

A hard, fairly heavy wood with straight grain and somewhat oily texture. As far as could be ascertained from small specimens, the heartwood is yellow-brown and the sapwood grey-brown. *Growth rings* : just visible with naked eye. *Vessels* : just visible with naked eye, individually distinct under a lens (x 10), numerous, solitary and in radial groups of 2-3. No deposits observed. *Parenchyma* : small amount of paratracheal parenchyma just visible. *Rays* : fine, numerous, just visible to the naked eye. Somewhat lighter in colour than the rest of the wood.

**MICROSCOPIC FEATURES.**

*Growth rings* : marked by 2-5 layers of radially flattened fibres contiguous to thin-walled fibres. *Vessels* : fairly evenly distributed, solitary and in radial groups of 2-3 (mostly 2), with occasional tangential clusters. Frequently contiguous to rays. Diameter of solitary vessels (including thickness of walls) radial 100-290 $\mu$  (mostly about 180 $\mu$ ), tangential 80-240 $\mu$  (mostly about 140 $\mu$ ). Circular to oval, uniform in size throughout growth-rings. Solitary vessels and groups per sq. mm. : 2-8 (mostly 4-6). Vessel-members : 200-770 $\mu$  (mostly about 400 $\mu$ ) long. End walls horizontal to very oblique. Perforations simple and rarely scalariform. Occasional deposits. *Intervascular pits* : bordered, arranged alternately, borders circular to somewhat angular where pits are crowded, apertures elongated horizontally but not beyond border. *Vessel-parenchyma pits* : half-bordered, horizontally elongated. *Vessel-ray pits* : half bordered, circular to considerably elongated horizontally or obliquely. *Fibres* : Groundwork of the wood composed of fibres, the walls 4-9.5 $\mu$  (mostly about 6 $\mu$ ) wide ; lumen only slightly wider than the walls, except at the boundaries of the growth rings. Maximum diameter of fibres : 15-38 $\mu$  (mostly about 27 $\mu$ ). Tendency to be rectangular in shape in transverse section. 850-1970 $\mu$  (mostly about 1400 $\mu$ ) long. Arranged in fairly regular radial rows : 0-2 septa per fibre. *Pits* : simple, vertically or obliquely elongated, minute. Occasional deposits and oil drops. *Parenchyma* : paratracheal parenchyma abundant, some vessels completely surrounded by 1-3 layers of cells. Metatracheal parenchyma less abundant, and in groups of up to 20 cells, usually contiguous to paratracheal parenchyma. Diameter of cells 23-73 $\times$ 15-55 $\mu$  (mostly about 40 $\times$ 26 $\mu$ ) ; irregular in transverse



*Cinnamomum parthenoxylon* Transverse Sect 105

[To face page 68]



*Cinnamomum parthenocylon* Tangent. l. Sect. 210  
 10 fa c pa e (9)

section but tending to be radially elongated, rectangular in longitudinal sections, ends horizontal. *Pits* between parenchyma cells : simple. *Rays* : 4-8 (mostly about 5) per mm., 1-3 seriate (mostly 2-3). Heterogeneous. 4-44 (mostly 15-20) cells high. Height 100-1160 $\mu$  (mostly about 420-500 $\mu$ ). Width 15-54 $\mu$  (mostly about 30 $\mu$ )—including thickness of the walls. Not storied. Cells 7-20  $\times$  15-35 $\mu$  (mostly about 15  $\times$  26 $\mu$ ), oval with longer axes vertical. Apical cells frequently elongated. Tangential walls (radial section) mostly vertical, others somewhat oblique. *Pits between ray cells* : small, simple. Opaque, brown deposits frequent, also occasional oil-drops. *Secretory cells* : large, thin-walled secretory cells frequent in the wood parenchyma, and occasional at the edge of the rays. 100-800 (mostly 400-600) per sq. cm. Mostly 170-240  $\times$  80-120 $\mu$  ; oval with longer axes vertical. Contents : oil. (The test for oil used was to soak wood sections in a tincture of Alcanin, the oil being stained bright red.). *Traumatic tissue* : groups of very irregularly arranged thin-walled cells were observed, up to 3 mm. tangentially by 0.5 mm. radially ; which appeared to be of traumatic origin.

**MATERIAL :** Forest Research Institute, Kepong, F.M.S. Nos. 0531, 0523, 1647, 22006, and 3542.

## 2. *Cinnamomum iners* Reinw. (Pl. IV, no. 1.)

**GENERAL PROPERTIES :** a fairly soft, light wood with a dry texture, light grey in colour.

**MICROSCOPIC FEATURES :** *Vessels* : 2-5 (mostly 2) in a group. Tangential diameter 53-140 $\mu$  (mostly about 80-95 $\mu$ ). Number of solitary vessels and groups per sq. mm. : 9-14 (mostly about 11). Frequent tyloses. *Fibres* : 21-38 $\mu$  (mostly about 23 $\mu$ ) wide, 320-1700 $\mu$  (mostly about 1280 $\mu$ ) long. Non-septate. Walls 3.8-8.0 $\mu$  (mostly about 4.5 $\mu$ ) thick, lumen never narrower than the walls. *Parenchyma* : very few vessels completely surrounded by paratracheal parenchyma. *Rays* : 100-1037 $\mu$  (mostly about 390 $\mu$ ) high, 11-46 $\mu$  (mostly 23-26 $\mu$ ) wide. Cells 7-50 $\mu$  (mostly 19 $\mu$ ) high. Oil drops absent. *Secretory cells* : 20-60 per sq. cm. and mostly about 180  $\times$  70 $\mu$ . Contents : mucilage. This was not detected in any other species examined. This was noted by Janssonius (3).

**MATERIAL :** Forest Research Institute, Kepong. Nos. 11011 and 16506.

## 3. *Alseodaphne penduliflora* Gamble. (Pl. IV, no. 2.)

**GENERAL PROPERTIES :** a hard wood with a smooth texture. Dark brown in colour.

**MICROSCOPIC FEATURES :** *Vessels* : in groups of 2-5, tending to be in oblique lines. Tangential diameter of solitary vessels : 46-131 $\mu$  (mostly about 115 $\mu$ ). Number of solitary vessels and groups per sq. mm. 5-9 (mostly about 7). Only simple perforations observed. Abundant tyloses. *Fibres* : walls 3.8-7.6 $\mu$  (mostly about 4.2 $\mu$ ) wide. Length 600-1790 $\mu$  (mostly about 1200 $\mu$ ).

2-6 (mostly 4) septa per fibre. *Rays*: heterogeneous, but only procumbent and sheath cells observed. 130-1045 $\mu$  (mostly about 530 $\mu$ ) high. 26-46 $\mu$  (mostly about 40 $\mu$ ) wide. *Secretory cells*: 65-75 per sq. cm. Size, mostly about 120 $\times$ 60. *Traumatic tissue*: none observed.

**MATERIAL.** Forest Research Institute, Kepong. Nos. 3201 and 10607.

#### 4. *Dehaasia Curtisii* Gamble. (Pl. V. no. 4.)

**GENERAL PROPERTIES**: a very heavy wood with a greasy texture. Glistening deposits in the vessels.

**MICROSCOPIC FEATURES**: *Vessels*: in groups of 2-5. Tangential diameter 42-133 $\mu$  (mostly about 100 $\mu$ ). Number of solitary vessels and groups per sq. mm. 6-12 (mostly about 9). Perforations: only simple ones observed. Tyloses abundant. *Fibres*: diameter mostly about 23 $\mu$ . Length, 690-1700 $\mu$  (mostly about 1270 $\mu$ ). 1-6 (mostly 3-4) septa per fibre. Walls, 3.5-12 $\mu$  (mostly about 7 $\mu$ ) thick. *Rays*: 100-1160 $\mu$  (mostly about 420-500 $\mu$ ) high. Mostly 26 $\mu$  wide. *Secretory cells*: 60-80 (mostly about 70) per sq. cm. Mostly 170 $\times$ 70 $\mu$ .

**MATERIAL**: Forest Research Institute, Kepong. Nos. 4626 and 5474.

#### 5. *Dehaasia cuneata* Blume.

**GENERAL PROPERTIES AND MACROSCOPIC FEATURES**: a very heavy wood with a greasy texture. *Parenchyma*: not visible with lens ( $\times 10$ ).

**MICROSCOPIC FEATURES**. *Vessels*: in groups of 2-10 (mostly 2-3). Tangential diameter 70-156 $\mu$  (mostly about 110 $\mu$ ). Number per sq. mm. 6-14 (mostly 8-9). Perforations mostly scalariform, but some simple. (Fig. 1). No deposits observed. Tyloses variable, sometimes abundant. *Fibres*: 560-1750 $\mu$  (mostly about 1220 $\mu$ ) long. 1-5 (mostly 2) septa per fibre. *Rays*: 15-43 $\mu$  (mostly about 31 $\mu$ ) wide. No oil observed in rays. *Secretory cells*: about 40 per sq. cm. Size mostly about 195 $\times$ 66 $\mu$ .

**MATERIAL**: Forest Research Institute, Kepong. Nos. 10396 and 27223.

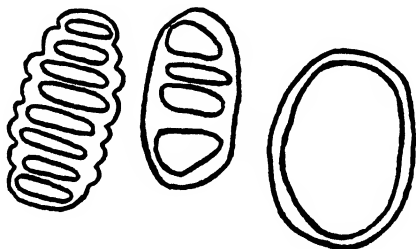
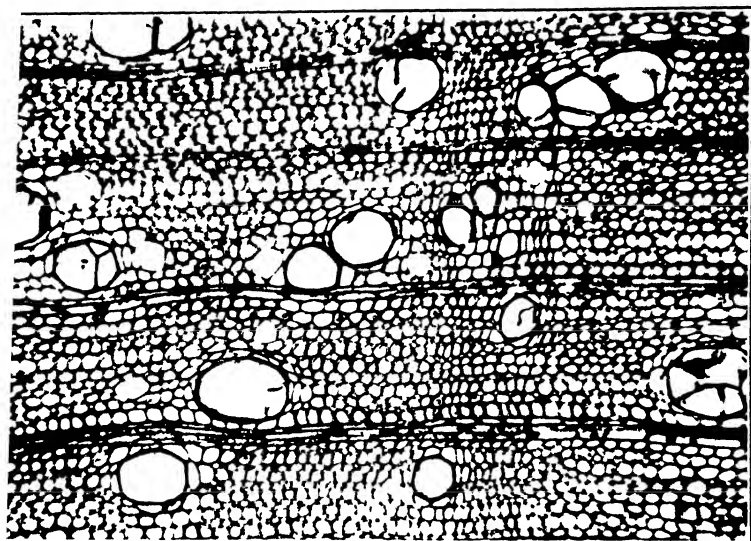
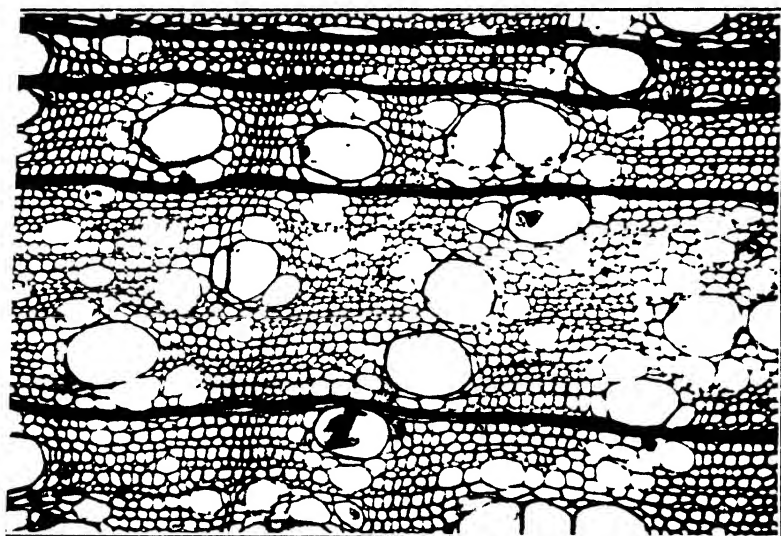


Fig.1. *Dehaasia cuneata*. Three types of perforations to be seen in radial sections.



2 *Uca daphne pendulifera* Transverse Sect 70



1 *Cumancium incus* Transverse Sect 70

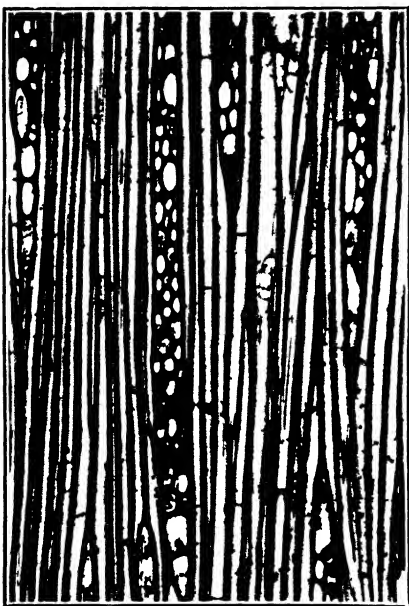




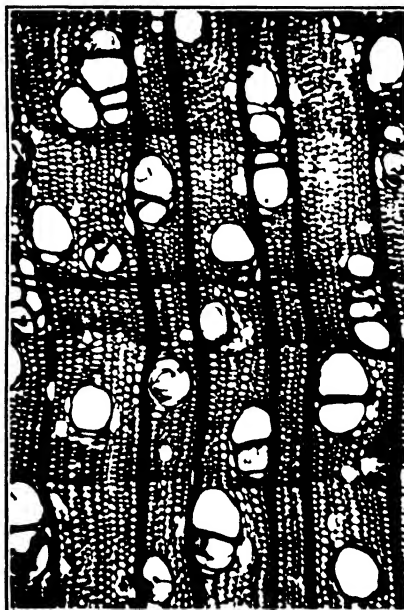
1 *Ilc daphne penduliflora* 1 m  
Longitud. Sect.  $\times 105$



2 *Ilc c. myristiciflora* 1 m  
Longitud. Sect.  $\times 105$



3 *Iritsea tomentosa* 1 m  
Sect.  $\times 105$



4 *Dehaasia Curtisi* Transverse  
Sect.  $52\frac{1}{2}$

6. *Litsea castanea* Hook. f. (Pl. VI, no. 3.)

GENERAL PROPERTIES. A light wood with a woolly texture. Light brown in colour.

MICROSCOPIC FEATURES. *Vessels* : in groups of 2-5. Number of solitary vessels and groups per sq. mm. 6-14 (mostly 8-9). Perforations simple and scalariform. No deposits observed. *Fibres* : septation very variable, even in a single section. Walls 2.3-5 $\mu$  (mostly about 3.4 $\mu$ ) thick. *Rays* : 86-1430 $\mu$  (mostly about 516 $\mu$ ) high. Mostly about 25 $\mu$  wide. *Secretory cells* : about 65 per sq. cm. Size mostly about 172 $\times$ 85 $\mu$ . *Traumatic Tissue* : none observed.

MATERIAL : Forest Research Institute, Kepong. Nos. 10593 and 1870.

7. *Litsea myristicaefolia* Wall. ex Hook. f. (Pl. V, no. 2.)

GENERAL PROPERTIES. A light wood with a woolly texture. Light yellow-brown in colour.

MICROSCOPIC FEATURES. *Vessels* : in groups of 2-5. 8-18 (mostly about 12) per sq. mm. Tangential diameter 70-150 $\mu$  (mostly about 100 $\mu$ ). Perforations mostly scalariform, and also simple. No deposits observed. *Fibres* : 590-1500 $\mu$  (mostly about 1200 $\mu$ ) long. Unseptate. Walls : 1.9-6 $\mu$  (mostly about 3.8 $\mu$ ) thick. *Rays* : mostly about 300-430 $\mu$  high. Mostly about 26 $\mu$  wide. *Secretory cells* : about 110 per sq. cm. Size about 144 $\times$ 78 $\mu$ .

MATERIAL : Forest Research Institute, Kepong. Nos. 12582 and 4205.

8. *Litsea megacarpa* Gamble. (Pl. VI, no. 2.)

GENERAL PROPERTIES AND MACROSCOPIC FEATURES. A fairly soft wood with a somewhat woolly texture. Light brown in colour. *Growth Rings* : not clearly defined.

MICROSCOPIC FEATURES. *Growth Rings* : tending to undulate. *Vessels* : in groups of 2-5. Tangential diameter 160-260 $\mu$  (mostly about 220 $\mu$ ). 1-5 (mostly 2-3) per sq. mm. Only simple perforations observed. *Fibres* : 19-46 $\mu$  (mostly about 30 $\mu$ ) wide. 1390-2040 $\mu$  (mostly about 1480 $\mu$ ) long. Unseptate or septa extremely rare. Walls : 1.9-4.6 $\mu$  (mostly about 3 $\mu$ ) thick. No deposits observed. *Rays* : 1-4 seriate. 68-770 $\mu$  (mostly about 340 $\mu$ ) high. 8-50 $\mu$  (mostly about 24 $\mu$ ) wide. Height of ray cells 8-40 $\mu$  (mostly about 20 $\mu$ ). No oil drops although abundant deposits. *Secretory cells* : absent or not more than 5 per sq. cm. Size about 130 $\times$ 53 $\mu$ . *Traumatic Tissue* : none observed.

MATERIAL : Forest Research Institute, Kepong. Nos. 8042, 29209, and 15276.

9. *Litsea tomentosa* Blume. (Pl. V, no. 3.)

GENERAL PROPERTIES AND MACROSCOPIC FEATURES. Texture not oily. *Growth Rings* : none clearly visible with lens. *Parenchyma* : not visible with lens.

**MICROSCOPIC FEATURES.** *Vessels*: in groups of 2-8. 4-12 (mostly about 7-8) per sq. mm. Tangential diameter 66-152 $\mu$  (mostly about 117 $\mu$ ). Perforations: mostly scalariform and also simple. Occasional tyloses. *Fibres*: mostly about 23 $\mu$  wide. 710-2176 $\mu$  (mostly about 1440 $\mu$ ) long. Walls: 3.8-7.6 $\mu$  (mostly about 5 $\mu$ ) thick. *Rays*: 223-1182 $\mu$  (mostly about 700 $\mu$ ) high. Mostly about 40 $\mu$  wide. *Secretory cells*: 0-2 per sq. cm. Size: mostly about 133 $\times$ 53 $\mu$ . *Traumatic Tissue*: none observed.

**MATERIAL**: Forest Research Institute, Kepong. Nos. 11027 and 15264.

**10. *Nothaphoebe panduriformis* Gamble.** (Pl. VI, no. 1.)

**GENERAL PROPERTIES AND MACROSCOPIC FEATURES.** A fairly hard but light wood with dry coarse texture. Heartwood light brown, sapwood light grey-brown. *Growth Rings*: very well defined. *Parenchyma*: none visible with lens.

**MICROSCOPIC FEATURES.** *Vessels*: in groups of 2-5. 4-10 (mostly about 6) per sq. mm. Tangential diameter 102-190 $\mu$  (mostly about 130 $\mu$ ). Only simple perforations observed. Occasional tyloses. *Fibres*: 850-1700 $\mu$  (mostly about 1190 $\mu$ ) long. 1.9-4.6 $\mu$  (mostly about 3 $\mu$ ) thick. *Rays*: 1-5 seriate. Cells mostly about 23 $\mu$  high. *Secretory cells*: mostly about 31 per sq. cm. Size: mostly about 175 $\times$ 60 $\mu$ . *Traumatic Tissue*: none observed.

**MATERIAL**: Forest Research Institute, Kepong. Nos. 8029 and 0587.

**ACKNOWLEDGMENTS.**

I wish to thank the Director of the Royal Botanic Gardens, Kew, for laboratory facilities, and Dr. C. R. Metcalfe for his invaluable help and advice in preparing this paper.

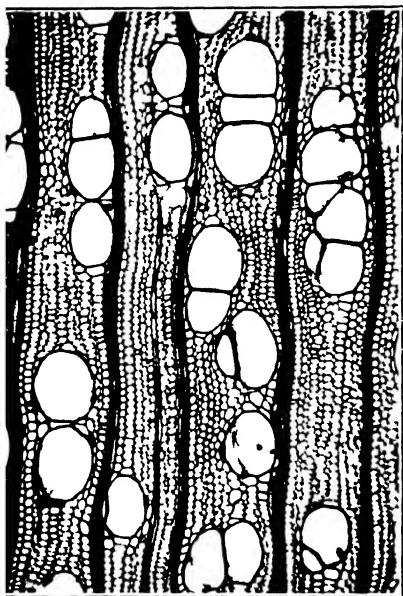
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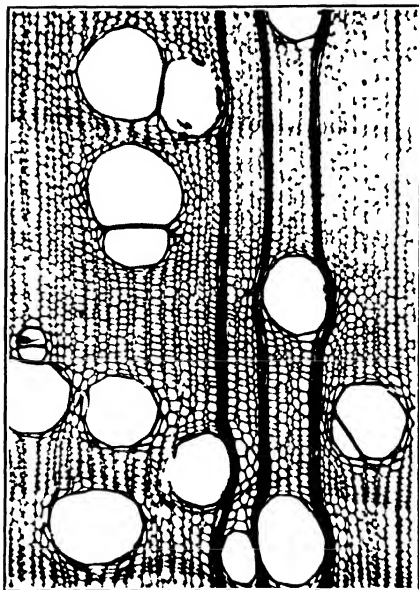
**XI—THE EFFECTS OF THE FROST OF MAY 16th, 1935.**

**Royal Botanic Gardens. Kew.**

The severe frost that occurred over the greater part of the country during the night of May 16th and the early morning of May 17th resulted in a good deal of injury to leaves, flowers and young shoots of trees and shrubs growing at Kew. Twelve degrees



1 *Xylophloeopanturium*  
Transverse Sect. 52½



2 *Litsea neocarpa* Transverse  
Sect. 52½



3 *Litsea castanea* Tangential Sect  
105



4 *Litsea megaripa* Tangential  
sect. 105



(22° F) of frost were recorded on the ground and 5 degrees (27° F) in a screened thermometer four feet above the ground. The most serious effects were from ground level to a height of 20 feet, but on some trees leaves were injured up to 40 or 50 feet.

It was very noticeable that while most of our native plants suffered injury to their young shoots, many South European, Western Hemisphere and other plants which are not very winter-hardy with us—in most cases requiring the shelter of walls—did not suffer any injury, even to the young growth. These include *Eucryphia glutinosa*, *Nothofagus* spp., *Feijoa Sellowiana*, *Olea europaea*, *Myrtus communis* and var. *tarentina*, and also many semi-tender *Ceanothus* spp. from California, e.g. *C. rigidus*, *C. dentatus*, *C. papillosus* and *C. thyrsiflorus*.

At the time of writing, January, 1936, one is better able to assess the real damage, and after careful inspection it is comforting to find that apart from the loss of flowers there is little trace of any permanent injury. This is due to the fact that in most cases, although the young leaves were killed, the growing points of the shoots were uninjured, with the result that they quickly made fresh growth. It remains to be seen how the floral display for this season may be affected.

The following is a list of plants whose reactions to the frost deserve comment, together with notes on the damage (or lack of it) that was observed.

#### ARBORETUM

**Acer.** In some places badly cut or browned as if scorched by fire. Partially developed leaves of *A. macrophyllum* browned.

**Actinidia.** Young shoots and leaves entirely killed.

**Buddleja.** The varieties of *B. variabilis* badly cut, but *B. globosa* nearby, undamaged.

**Catalpa.** New growth killed.

**Celastrus.** Chinese and Japanese species, young shoots badly damaged.

**Davidia.** *D. Vilmoriana*, shoots and flowers killed.

**Diospyros.** New growth killed.

**Emmenopterys.** *E. Henryi*, new shoots killed.

**Fraxinus.** In some places common ash badly cut and browned.

**Ginkgo.** Leaves damaged up to 25 feet ; above that unharmed.

**Hedera.** Young shoots and new leaves of ivy destroyed in exposed positions.

**Juglans.** New shoots and young leaves killed or badly damaged, including common walnut (*J. regia*).

**Liriodendron.** Leaves damaged up to 25 feet; above that unharmed.

**Magnolia.** Young shoots, leaves and flowers badly damaged. Shoots of *M. Wilsoni*, *M. Dawsoniana* and *M. Sargentiana*, and of the newer Chinese species, also *M. Watsoni*, entirely killed.

**Meliosma.** *M. Veitchiorum*, new shoots killed.

**Morus.** Young shoots blackened.

**Paulownia.** New growth killed.

**Platanus.** *P. cuneata*, new growth killed.

**Quercus.** Turkey oaks badly cut in some places.

**Rhododendron.** Young shoots and flowers badly damaged, except in very sheltered positions. Fully opened flowers on bed of Loder's white in Broad Walk entirely destroyed. Young shoots of many Chinese species badly damaged, some entirely killed. Many new shoots and all flowers and opening buds of azaleas in the Azalea Garden entirely destroyed.

**Schizandra.** Young shoots and leaves entirely killed.

**Styrax.** *S. Veitchiorum*, new shoots killed.

**Taxus.** *T. baccata* vars. in nursery, new shoots killed.

**Vitis.** New shoots of practically all vines killed, including *Vitis coignetiae*, which has suffered badly.

**Wisteria.** Flowers and new shoots entirely killed in open and on exposed walls.

#### HERBACEOUS GROUND

##### DICOTYLEDONS.

**Ranunculaceae.** No damage.

**Berberidaceae.** *Epimedium rubrum* and *E. Youngianum* damaged, while *E. Youngianum* var. *niveum* escaped.

**Papaveraceae** *Macleaya* spp., damaged, while *Papaver*, *Podophyllum*, *Eschscholtzia* and *Argemone* escaped.

**Fumariaceae** *Dicentra oregona* and *D. formosa* were untouched.

**Cruciferae, Violaceae, Resedaceae, Cistaceae, Caryophyllaceae and Malvaceae, Linaceae,** uninjured.

**Geraniaceae.** *Impatiens* and *Tropaeolum*, seedlings killed. *Geranium anemonefolium*, badly damaged. *Limnanthes Douglasi* and *L. alba* in flower were not injured.

**Sapindaceae.** *Melianthus major* had five inflorescences fully developed, some 5 to 6 feet high, which were not damaged.

**Rosaceae.** *Tolmiea Menziesii* and *Tellima grandiflora* badly damaged; *Astilbe chinensis* slightly damaged.

**Leguminosae.** *Phaseolus* and *Glycine* killed, and *Vicia gigantea* badly damaged.

**Loasaceae.** *Datisca cannabina* badly damaged, but two inch seedlings of *Loasa* and *Blumenbachia* were untouched.

**Cucurbitaceae.** *Bryonia dioica* and *B. alba* damaged; *Echinocistis lobata* and *E. fabacea* 3 inch seedlings escaped, and *Ecballium Elaterium* unharmed.

**Umbelliferae.** Not injured.

**Compositae.** *Cosmos* killed. *Zinnias* cut to base. *Inula barbata* and *I. Hookeri* badly damaged. *Bupthalmum speciosum*, *Eupatorium ageratoides* and *Tripteris Vaillantii* badly damaged. *Helianthemums* one to two feet high, both annual and perennial, were unharmed.

**Apocynaceae.** *Vincetoxicum* spp. all damaged. *Asclepias* not injured.

**Convolvulaceae.** *Ipomoea coerulea* and other spp. killed. *Nolana* spp. untouched.

**Solanaceae.** *Nicotiana*, *Saracha* and *Physalis*, except *P. Franchettii* and *P. Alkekengii*, killed.

**Scrophulariaceae.** *Penstemon* spp. in flower damaged.

**Labiatae.** *Elsholtzia polystachya*, *Plectranthus rugosus*, *Elsholtzia Stauntoni* and *Comanthosphace sub lanceolata* all badly damaged. *Eremostachys* untouched.

**Polygonaceae.** *Rheum* spp., *Polygonum paniculatum*, *P. cuspidatum*, *Fagopyrum cymosum* and *Oxyria sinensis* all badly damaged.

**Euphorbiaceae.** Several spp. of *Euphorbia* were in flower and were untouched, e.g., *E. Characias* and *E. epithymoides*.

**Urticaceae.** *Boehmeria nivea*, *Laportea canadensis* and *Parietaria officinalis* all badly damaged.



## MONOCOTYLEDONS.

**Cyperaceae** and **Gramineae** untouched.

**Liliaceae.** No serious damage, but young growth injured in *Uvularia grandiflora* and *Hosta* spp.; many of the *Eremurus* were badly damaged, particularly those in a more exposed situation between the Rock Garden and Family Beds.

**Amaryllidaceae.** No apparent damage, even *Alstroemeria* escaped injury.

**Dioscoreaceae.** All species of *Dioscorea* were cut to the ground.

**Iridaceae.** The display of May and June flowering Iris was ruined, many of the varieties having the flowers or buds completely frozen, the damage being either to the soft stem below the flower or to the actual ovary of the flowers. This applied equally to the North American species—*I. tenax*, *I. Douglasii*, etc.,—though later buds matured and flowered well.

**Hardy ferns.** The majority of these were not sufficiently far advanced to be seriously damaged, but some varieties of *Aspidium* and *Asplenium* in particular were injured.

## ROCK GARDEN

**Acer.** All Japanese varieties, young growth damaged.

**Bergenia.** All species, particularly *B. ciliata* and *B. ligulatas*, open flowers and buds damaged.

**Ceratostigma.** *C. Willmottiana*, young growth damaged.

**Cedrus.** *C. Libani* var. *pygmaea*, young growth cut back.

**Cupressus.** *C. obtusa* varieties, young growth cut back.

**Cypripedium.** *C. parviflorum*, foliage damaged.

**Epimedium.** *E. pinnatum*, foliage damaged.

**Erica.** *E. carnea* and varieties, young growth damaged.

**Kirengeshoma.** *K. palmata*, badly cut.

**Mertensia.** *M. virginica*, flowers damaged.

**Mimulus.** *M. ringens*, flowers damaged.

**Meconopsis.** *M. regia*, flowers damaged.

**Osmunda.** *O. regalis*, one plant in exposed position, badly damaged ; others more sheltered, escaped.

**Picea.** *P. Abies* and *P. excelsa*, young growth cut back.

**Primula.** *P. japonica*, *P. pulverulenta* and other species, flowers badly damaged.

**Penstemon.** *P. Barrettae*, *P. Newberryi*, *P. Scouleri* and other species, flowers damaged.

**Rhododendron.** *R. obtusum*, *R. Davidsonianum* and *R. William-sianum* (foliage) badly damaged.

**Rodgersia.** *R. podophylla* and *R. Purdomi* badly injured. *R. pinnata*, just starting, escaped.

**Saxifraga.** *S. Fortunei* and *S. sarmentosa* badly damaged.

**Tricyrtis.** *T. macrantha* and *T. hirta* badly damaged.

**Tsuga.** *T. canadensis* var. *pendula* and *T. Sieboldii* var. *nana*, young growth cut back.

While no permanent damage seems to have resulted from the frost it had a distinct effect on the seed crop, many of the injured plants had to make a second growth which failed to set and mature seeds.

## National Pinetum Bedgebury.

W. DALLIMORE

A good deal of harm was done to the young trees at Bedgebury by the severe frost that occurred during the night of May 16th and the early morning of May 17th, but it is interesting to note that some species that are doubtfully hardy escaped serious injury, whereas perfectly hardy kinds so far as winter cold is concerned had all their young shoots killed, and here and there a tree or two of a particular species escaped, while the others were severely injured.

As has been noted on other occasions the severity of the frost varied in different parts of the 52 acres comprising the Pinetum. In a low place a short distance from Marshall's Lake 19 degrees of frost were registered on the ground. A few hundred yards away on ground 30 or 40 ft. higher, 14 degrees were recorded. In another part at a very similar elevation 13 degrees of frost occurred on the ground and 7 degrees were recorded by a screened thermometer

4 ft. 3 in. above the ground. Nearby, in the open, 11 degrees were registered at one foot above the ground and 9 degrees at 5 ft. In a low place in another part of the Pinetum 17 degrees of ground frost were recorded and at a high point near the gravel pit there were 15 degrees. Common plants such as bracken, brambles, nettles, ivy and grasses were injured, and young shoots were killed on oak, ash, walnut, rhododendrons, sweet chestnut, and holly. In some places old leaves of *Rhododendron ponticum* and other species, also of common laurels, were killed, and on some rhododendrons last year's wood was destroyed.

Amongst the trees in the collection the degree of injury was largely determined by the quantity of new growth that had been formed, the newer conifers from China being the greatest sufferers, but some species that usually escape frost injury were also cut. Pines, on the whole, were not far enough advanced to receive serious injury, but practically all the young shoots on the Japanese *Pinus parviflora* were frozen and the young growth on the Siberian *P. pumila* appears to have been checked.

Lawson's Cypress is usually regarded as a particularly hardy tree but it suffered more than the tenderer *C. macrocarpa*. In some places there was some browning of leaves on large trees of *C. Lawsoniana*, but natural seedlings suffered more. Some of them were quite brown and in early June looked as though they might be permanently injured. Several varieties of *C. Lawsoniana* suffered, notably *erecta filiformis*, *erecta viridis*, *Allumii*, *juniperina*, *lutea Pottensii*, *intertexta*, *tamariscifolia*, *Rosenthalii*, *Fletcheri*, *nivea*, *glauca*, and a dwarf unnamed variety. *Cupressus thyoides* planted in a low wet place where 17 degrees of frost were recorded escaped injury, but *C. Lawsoniana* growing nearby was browned. Occasion has previously been taken of directing attention to the value of *C. thyoides* for planting in wet ground in low-lying places. *C. nootkatensis* was not injured but the tips of shoots of *C. sempervirens* were frozen and *C. Duclouxiana* was turned brown. *C. lusitanica*, *C. Goveniana*, *C. macrocarpa* and *C. torulosa* were not appreciably affected. The hybrid *C. Leylandii* also escaped injury although growing in a low wet place.

The American species of *Abies* fared better than the Asiatic species. Of the former *A. lasiocarpa*, *A. balsamea*, *A. Fraseri* and *A. venusta* were most seriously injured. *A. nobilis*, *A. magnifica*, *A. grandis*, *A. amabilis* and *A. Lowiana* escaped; one or two trees of *A. concolor* were slightly browned. Of the Asiatic species *A. Forrestii*, *A. recurvata*, *A. nephrolepis*, *A. Veitchii*, *A. sachalinensis* and *A. Faxoniana* were all badly cut. Of *A. Mariesii*, *A. firma*, *A. homolepis* (*A. brachyphylla*), and *A. koreana* some trees were seriously injured, others not. Of three trees of *A. koreana* growing in a triangle about 10 ft. from each other, two were cut and the other one was practically unscathed. Several young oaks growing amongst these *Abies* had all their young shoots and leaves blackened.

Of European *Abies*, *A. Nordmanniana* and *A. Pinsapo* received little injury, but *A. alba* and *A. cephalonica* were badly cut. *A. cilicica* and *A. numidica* were also badly injured.

The tips of the shoots of a few larches were injured, particularly *Larix Potaninii*, but on the whole the larches came through the test very well, although they suffered badly on the forest plots. Some *Pseudotsuga* spp. were frozen, others escaped with little injury. The most seriously injured were *P. Forrestii*, *P. japonica*, *P. macrocarpa*, some trees of *P. glauca* and *P. Douglasii* var. *Fretsii*.

Tips of shoots of *Cunninghamia lanceolata* were frozen and the points of branches of *Cryptomeria japonica* var. *elegans* and *elegans nana* were killed. *Thuja dolabrata* received some injury but generally the thujas suffered less than some of the other genera. Tsugas were badly cut, particularly *T. chinensis*, *T. diversifolia*, *T. Sieboldii*, *T. Mertensiana* and some of the trees of *T. heterophylla*. One tree of *T. Sieboldii* escaped with little harm while other trees were badly frozen. *Cedrus atlantica* is little the worse for freezing but *C. Libani*, *C. brevifolia* and *C. Deodara* are slightly injured. The sequoias have practically escaped but some of the leaves of *S. sempervirens* are browned. The junipers have not suffered very much. Some shoots were killed on *Taxodium distichum* but they were not growing very fast at the time of the frost. *Taiwania cryptomerioides* has not been injured and *Sciadopitys verticillata* appears to be quite sound. A few yews were cut, chiefly *Taxus cuspidata* and its varieties, and some dwarf forms of *T. baccata*.

Spruces vary a good deal in the way they were affected. *Picea sitchensis* suffered badly, as also did *P. spinulosa*, *P. Smithiana*, *P. Abies (excelsa)* and varieties, *P. orientalis*, *P. Wilsonii*, *P. glauca*, *P. albertiana* and variety *conica*, *P. jezoensis* and variety *hondoensis*, *P. morrisonicola*, *P. asperata* (some trees), *P. likiangensis* (some trees), and *P. Glehni*. Species not badly injured are *P. rubra*, *P. polita*, *P. Koyamai*, *P. Maximowiczii*, *P. pungens*, *P. brachytyla*, *P. omorika*, *P. Schrenkiana* and *P. bicolor*. It is particularly interesting to note that *P. omorika* escaped even when growing in a low wet place. This is the most promising of the lesser known spruces for planting under forest conditions. *P. polita* is always the last of the spruces to break its growth and it usually escapes frost injury. Unfortunately it is of no value for commercial planting.

Many of the newer Chinese species of *Rhododendron* were badly frozen, also hybrids from them and from the Himalayan *R. Griffithianum* and *R. Foryunei*. As at Kew, hybrid rhododendrons containing a good deal of *R. catawbiense* blood escaped serious injury. In the low-lying parts common oaks 50 or 60 ft. high had all their leaves blackened. Ash was as bad, and beech trees, more particularly the purple-leaved beech, had many leaves browned. On higher ground the damage was rather less severe.

On my way to Bedgebury I had to visit Hartfield near East Grinstead, and in order to be able to see something of the condition of the trees in the valley between Tunbridge Wells and Hartfield,

I made the journey from Tonbridge by road. Everywhere on the lower ground oak and ash were black. Chestnut coppice was as bad, and large sweet chestnut trees had their leaves injured. Sycamore was badly cut, and in some places horse chestnut leaves were badly injured. On the common at Tunbridge Wells the inflorescences of one tree were killed and apparently dried on the branches, and on another tree most of the leaves were killed. Leaves of hazel in some places were badly injured as were also beech leaves. Ivy was also blackened. Large conifers, spruce, Douglas fir and larch do not appear to be seriously injured and birch and alder seem to be untouched. From what could be seen from the train the whole of the trees on the low ground between Sevenoaks and Paddock Wood had been as badly frozen as those between Tunbridge Wells and Hartfield, but on the ridges in all parts neither oak, ash, nor beech appeared to have received serious injury. After fifty years work amongst trees I cannot recall on any previous occasion anything approaching the devastation caused by that one night's frost.

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The above account was written in June, 1934 and it is now possible to decide what the true extent of the frost injury was. In a number of species of *Picea*, *Abies* and *Tsuga*, terminal shoots formed in 1934 are dead, and new leaders can only be expected from dormant buds on the lower trunk. However, very few such buds broke into growth during the summer. A good many natural seedlings of Lawson's cypress were killed, otherwise few plants were lost, although there are some that look as though they may not recover. Pines were not permanently injured, though the average rate of annual growth was reduced. Douglas firs and Sitka spruces growing in plantations a few hundred yards away were even more severely injured than the trees in the Pinetum.

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**X—NEW OR NOTEWORTHY SOUTH AFRICAN PLANTS.\* VIII. NEW COMPOSITAE FROM THE TRANSVAAL.**  
J. BURTT DAVY AND J. HUTCHINSON.

TRIBE SENECEIONIDEAE.

142. *Cineraria Burkel* *Burtt Davy*, sp. nov. ; affinis *C. erosae* Harv. sed capitulis circiter 8-floris differt, et *C. longipedi* S. Moore sed caulibus foliisque scabridis sublanatis, foliis irregulariter lyrato-pinnatilobatis differt.

*Herba* valida, erecta, ad 30 cm. alta ; caulis scaber, sublanatus, alte striatus. *Folia* irregulariter lyrato-pinnatipartita vel pinnatilobata, alte et acute dentata ; lobi laterales inaequales, oblongi vel obovati, superiores limbo 3–5-lobato confluentes. *Panicula* corymbosa, terminalis, conferta vel laxa ; pedunculi arachnoideopilosi, bracteis erectis muniti. *Capitula* circiter 8-flora, 8 mm.

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\* Continued from the Kew Bulletin 1935 p. 572.

diametro. *Involucris bracteae* 5-7, quam flores disci breviores, acutae vel acuminatae, 5 mm. longae, glabrae vel basi leviter arachnoideo-pilosae. *Achaenia* hispida, margine angusto ciliato.

TRANSVAAL. Potchefstroom District: near Schoon Spruit, *Burke* sine numero, in Kew herb. (type).

Also in the Orange Free State, British Bechuanaland, and Griqualand West.

143. *Cineraria parvifolia* *Burt Davy*, sp. nov., affinis *C. lyratae* DC., sed *achaeeniis* pubescentibus, *involucris bracteis* pluribus differt.

*Herba* perennis, lignosa, caule et ramis glabris alte striatis. *Folia* 3-5-pinnatisecta; lobus terminalis ovato-cordatus, apice iterum 3-5-lobatus, margine alte (loborum lateralium minutius) dentatus; petiolus angulatus, basi auriculatus. *Inflorescentia* corymbosa, laxa; bracteae sparsae, subulato-lanceolatae; pedicelli 7-15 mm. longi. *Capitula* pauca, 6 mm. diametro. *Involucris bracteae* circiter 13, 4-5 mm. longae, glabrae, acutae, oblongae vel lanceolatae, costatae, margine ciliatae.

TRANSVAAL. Pretoria District: Irene, *Burt Davy* 7791, in Kew herb. (type); Meintjes Kop, *Conrath* 470.

144. *Senecio Holubii* *Hutch. et Burt Davy*, sp. nov.; affinis *S. concolori* DC., sed foliis pedunculis et *involucris bracteis* glabris, capitulis disciformibus nec radiatis differt.

*Herba* perennis (?) ad 40 cm. alta; caulis erectus, glaber, fistulosus (?), striatus, sicco circiter 3 mm. diametro, ramulos breves floriferos e nodis inferioribus emittens. *Folia* caulina superiora (cetera haud visa) internodiis aequilonga, ascendentia, glabra vel sparsissime albo-pilosa, 4-5 cm. longa, 0.15-0.4 cm. lata, linearia, obtusa, basi auriculata amplexicaulia, margine integra vel distanter sinuato-dentata. *Inflorescentia* subcorymbosa, pauciflora; pedunculi 1-8 cm. longi, erecti, glabri; bracteae paucae, patentes, ovatae, 1-2 mm. longae. *Capitula* solitaria, 8 mm. longa, 10 mm. lata, late campanulata; flores radii 0. *Involucris bracteae* 12-15, circiter 6 mm. longae, lineares, glabrae; bracteae calyculi paucae, lanceolatae, parvae. *Achaenia* (immatura) in angulis scaberula.

TRANSVAAL. Marico District: Matebe Valley, *Holub* 1609-1611 in Kew herb. (types).

145. *Senecio Junodii* *Hutch. et Burt Davy*, sp. nov.; affinis *S. pentactino* Klatt, sed capitulis paucioribus laxius corymbosis differt.

*Suffrutex* ad 1 m. altus; caules lignosi, foliati, striati, glabri vel leviter pubescentes. *Folia* glabra, subtus glaucescentia, ad 7 cm. longa, 1.2 cm. lata, lanceolata, ascendentia vel subpatentia,

apice subacuta, basi in petiolum brevem sensim attenuata, margine regulariter serrulata. *Capitula* pauca (circiter 12), laxe corymbosa, circiter 1 cm. longa; pedunculus circiter 1 cm. longus. *Involucri* bracteae 6 mm. longae, glabrae; bracteae calyculi exterioris latae, rigide ciliolatae. *Flores radii* flavi.

TRANSVAAL. Pietersburg District: "Shilouvane, in silvas Marouvogne," March, *Junod* 1170 in Kew herb. (type).

146. *Senecio lydenburgensis* Hutch. et Burtt Davy, sp. nov.; affinis *S. albanensi* var. *leiophyllo* Harv., sed achaeniis pubescentibus, caule basi lanato differt.

*Herba* perennis, 30–60 cm. alta; caulis erectus, circiter 3 mm. diametro, parce foliatus, praeter basin lanatam glaber, internodiis folia caulina aequantibus. *Folia basalia* erecta, coriacea, glabra, circiter 12 cm. longa, 1 cm. lata, lanceolata, apice obtusa, basin versus attenuata, margine dentibus albis callosis crenulato-dentata; petiolus tenuis, basi late amplexicaulis. *Folia caulina* sessilia, 3·5–5 cm. longa, 0·6–0·8 cm. lata, lanceolata vel oblonga, apice acuminata vel obtusa, basi subauriculata et late amplexicaulia. *Inflorescentia* corymbosa, parce ramosa; bracteae basales foliaceae, lineari-lanceolatae; rami ad 13 cm. longi; pedunculi pro ramo 1–2, nudi vel bracteis 1–2 subulatis induti. *Capitula* circiter 1·2 cm. longa, 1·5 cm. lata, campanulata, calyculata; flores radii flavi. *Involucri bracteae* circiter 1·2 cm. longae, acuminatae, floribus aequilongae; calyculi bractae longae, lineares, acuminatae.

TRANSVAAL. Lydenburg District: by the Large Waterfall, Lydenburg, November, *Wilms* 809 in Kew herb. (type).

Conrath 507 from Modderfontein, Pretoria District, appears to belong here, but differs from the type in the shorter, less acuminate, more resinously-keeled involucre bracts, and the shorter leaves.

147. *Senecio Mooreanus* Hutch. et Burtt Davy, sp. nov.; affinis *S. Sandersonii* Harv., a qua ramulis foliisque glabris, nec glanduloso-pubescentibus recedit.

*Herba* perennis ad 55 cm. alta; caulis fistulosus, glaber, alte striatus, remote foliatus, internodiis circiter 4 cm. longis, basi circiter 5 mm. diametro. *Folia* glabra, coriacea, crassa, sessilia, 8–10 cm. longa, 1·1 cm. lata, linearia vel lineari-lanceolata, basi late amplexicaulia, apice obtusa, margine dentibus repandis callosis prominentibus. *Inflorescentia* subcorymbosa; pedunculi 1–1·5 cm. longi, bracteis sparsis lanceolatis acuminatis muniti. *Involucri bracteae* ultra 1 cm. longae, pilis longis articulatis adpressis sparse pubescentes, margine late brunneo-scariosae.

TRANSVAAL. Carolina District: Carolina, Dec., *Bolus* 12031, in Kew herb. (type).

148. *Senecio scitus* Hutch. et Burtt Davy, sp. nov.; affinis *S.*

*bupleuroidi* DC., sed capitulis multo majoribus manifestius campanulatis, pedunculis longioribus, et involucri bracteis pluribus majoribus differt.

*Herba* erecta perennis, ad 50 cm. alta ; caulis unicus nec infra inflorescentiam ramosus, gracilis, flexuosus, striatus, praeter basin dense cinereo-lanatum (sicco 2 mm. diametro) glaber. *Folia* glabra, quam internodia multo longiora, 10–15 cm. longa, linearilanceolata vel anguste lanceolata, acuminata, amplexicaulia, subtus glaucescentia, inferiora imbricata, superiora incurvo-patentia ; nervi paralleli, subtus prominentes. *Rami inflorescentiae* longi, divaricati, nudi ; bractee basales solitaires, breviter subulatae ; pedunculi glabri, 3–7 cm. longi, bracteis 1–4 parvis adpressis subulatis muniti. *Capitula* solitaria, circiter 1 cm. longa et 1.5 cm. lata ; *flores* radii flavi. *Involucri bractee* circiter 15, glabrae, 0.5 cm. longae. *Achaenia* striata, glabra.

TRANSVAAL. Lydenburg District : at Lydenburg, *Wilms* 762 in Kew herb. (type). Also in the Barberton, Carolina, Pretoria, and Witwatersrand Districts, and in Griqualand East.

149. *Senecio Serra* Sond. var. *macrocephalus* Hutch. et Burt Davy, var. nov. ; a typo capitulis valde majoribus, involucri bracteis usque ad 8 mm. longis recedit.

TRANSVAAL. Heidelberg District : farm Uitgevalen, near Vereeniging, *Burt Davy* 9136 (type). Also in the Lydenburg, Pietersburg and Witwatersrand Districts, and in Natal.

#### TRIBE ANTHEMIDEAE.

150. *Athanasia calva* Hutch., sp. nov. ; affinis *A. punctatae* Harv., a qua foliis saepe pubescentibus, receptaculo conico, et achaeniis epapposis facile distinguitur.

*Planta* lignosa, usque ad 50 cm. alta ; ramuli erecti, virgati, dense cinereo-tomentosi, striati. *Folia* oblanceolata, integra vel apicem versus 3–5-dentata vel serrata, subtus pubescentia vel glabrescentia, glandulis nigris conspicuis punctata. *Inflorescentia* densa, corymbosa, terminalis ; pedunculus circiter 3 cm. longus, bracteis ad 5 mm. longis ; pedicelli 1 cm. longi, bracteis paucis 1 mm. longis. *Involucrum* globosum, 6–8 mm. diametro ; bractee circiter 5 mm. longae, lanceolatae, exteriores breviores ; receptaculum conicum. *Achaenia* epapposa.

TRANSVAAL. Barberton District : Saddleback Mountain, March, *Galpin* 1312, in Kew herb. (type). Lydenburg District : at Pilgrim's Rest, April, *Rogers* 18551.

NATAL. Charlestown and Van Reenen, *O. Kuntze*.

151. *Athanasia Dregeana* Harv. var. *sessilis* Burt Davy, var. nov. ; a typo capitulis ad apicem ramulorum sessilibus differt.



TRANSVAAL. Lydenburg District : at Lydenburg, *McLea* 5730, in Bolus herb. (type).

Better material may prove this to be a distinct species. Typical *A. Dregeana* Harv. occurs in Natal, Griqualand East, and Pondo-land (between the Umzimkaba and Umzimvula Rivers, *Drege*, type).

152. *Athanasia turbinata* *Burti* Davy, sp. nov. ; affinis *A. lini-foliae* Harv. (non Linn.) sed capitulis turbinatis differt.

*Planta* lignosa, usque ad 30 cm. alta ; rami pauci, virgati, glabri, striati. *Folia* ad 2 cm. longa, 1 mm. lata, linearia, integra. *Inflorescentia* terminalis, dense corymbosa ; bracteae sparsae, lanceolatae, circiter 2 mm. longae ; pedunculi et pedicelli gracillimi. *Involucrum* turbinatum, 3 mm. longum, apice 3 mm. latum ; bracteae angustissimae, glanduliferae, ad 2 mm. longae. *Capitulum* circiter 15-florum. *Achaenia* epapposa.

TRANSVAAL. Lydenburg District : at Lydenburg, October, *Wilms* 792 and 792a, in Kew herb. (types).

153. *Chrysanthemum lasiopodum* *Hutch.*, sp. nov. ; affine *C. decurrenti* Hutch., sed ramulis puberulis, foliis minoribus 6-8-pinnatipartitis differt.

*Herba* perennis ad 40 cm. alta ; caulis unicus erectus, basi villosus, striatus, sparse et breviter pilosus, ramulis brevibus fastigiatis densifoliatis puberulis. *Folia* imbricata, adpressa, circiter 6 mm. longa, 6-8-pinnatipartita ; lobi 1.5-3 mm. longi, lineari-subulati, glabri, glanduloso-punctati, apice longe mucronati, 2 basales reflexi. *Capitula* solitaria, terminalia, longe pedunculata, circiter 1.5 cm. diametro ; pedunculi glabri, striati, 10-20 cm. longi, foliis fasciculatis sparse vestiti. *Involucrum* circiter 0.5 cm. longum, 1.2 cm. latum ; bracteae ovatae, 0.5 cm. longae. *Flores radii* ligulati, 1 cm. longi ; flores disci circiter 0.8 cm. longi. *Achaenia* plus minusve glandulosa ; pappus bene evolutus, corollae tubi dimidio aequilongus.

TRANSVAAL. Lydenburg District : at Elandspruitbergen, alt. 7,600 ft., December, *Schlechter* 3846, in Kew herb. (type).

I am in some doubt as to the generic position of this species. The habit, pappus, etc., are those of *Chrysanthemum*, but the achenes are somewhat glandular as in *Phymaspermum* ; it appears to be almost intermediate between the two genera.—J.H.

#### TRIBE INULEAE.

154. *Callilepis lancifolia* *Burti* Davy, sp. nov. ; affinis *C. Laureolae* DC., sed foliis oblanceolatis subpetiolatis, pappi squama una producta valde angustiore differt.

*Herba* erecta, perennis, ad 30 cm. alta, e caudice lignoso caules annuos emittens ; ramuli hispiduli, leviter striati, dense foliati. *Folia* ascendentia subpetiolata, pilis molliibus sparse pubescentia, 2.5-5 cm. longa, 0.3-0.6 cm. lata, anguste oblanceolata, acuta, ad

basin sensim attenuata. *Capitulum* solitarium, circiter 1.3 cm. longum, 4 cm. latum; pedunculus elongatus, ad apicem foliis gradatim minoribus laxè vestitus. *Flores radii* ad 2 cm. longi; ligula ad 7 mm. lata. *Achaenia* unilateraliter alata; squama una producta, anguste lanceolata, acuminata, ceterae minutae.

TRANSVAAL. Carolina District: near Carolina, November, Rogers 19689, in Kew herb. (type). Barberton District: Kaapsche Hoop, Rogers 21285.

155. *Tarchonanthus Galpinii* Hutch. et Phillips sp. nov.; affinis *T. trilobo* DC., a qua foliis haud cuneatis nec breviter lobatis neque sinuato-dentatis recedit.

*Arbor* vel *frutex*; ramuli novelli et petioli albido-flavo-vel fulvo-tomentosi vel fere lanati, annotini incano-fulvo-tomentelli, cicatricibus foliorum numerosis propinquis notati; petioli lati, complanati, fere alati, leviter decurrentes, circiter 1 cm. longi. *Folia* elliptica vel oblongo-lanceolata, apice acuta vel obtusa vel rotundata, basi cuneata, 7.5–14.5 cm. longa, 1.5–4.5 cm. lata, supra glabrescentia, bullata et minute areolata, infra reticulata, dense albido-flavo-vel albido-tomentosa, margine integerrimo vel leviter et irregulariter dentato. *Inflorescentiae* prope apicem ramulorum axillares, foliis circiter aequilongae; bractae lineares vel subulatae vel oblongo-spatulatae, circiter 1 cm. longae, lanatae. *Capitula* lanata, femina uniflora.

TRANSVAAL. Barberton District: Hyslops Creek, at 2800 ft. Galpin 926, in Kew herb. (type). Lydenburg District: Farm Magaliesknop, at edge of forest, Kotze in Forest Herb. 2808. Waterberg District: Pyramid Estate near Potgietersrust, ravine in Granite Mts. at 5500 ft. Galpin 9000. Flowering March-April.

Mr. Kotze's specimen is from a tree with branched bole, described as about 30 ft. high, the largest limb having a girth at breast height of 3 ft. 10 ins.

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## XI—THE DATES OF HOOKER'S "BOTANICAL MISCELLANY."\*—H. S. MARSHALL.

This periodical consists of three volumes dated, (on their title-pages), "1830," "1831" and "1833" respectively, and these dates have been accepted as correct in botanical works of reference such as Pfeiffer's *Nomenclator* (1873–74), the *Index Kewensis* (1893–95), Dalla Torre et Harms, *Genera Siphonogamarum* (1900–07), Post et Kuntze, *Lexicon Generum Phanerogamarum* (1903), and Lemée, *Dictionnaire . . . des genres de plantes phanérogames* (1929–35). Actually, however, the three volumes appeared in nine parts from

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\* See The Dates of Hooker's "Companion to the Botanical Magazine" (K. B. 1933, 362).

April 1829 to March 1833 inclusive. Owing to the considerable number of new genera and species \* whose dates of publication are concerned, it has seemed worth while to make an extended search in the botanical literature of the period for notices and reviews of the several parts of the "Botanical Miscellany." Information has been obtained from the following sources :—

Loudon's Magazine of Natural History, 1-6 (1829-33) ; Loudon's Gardener's Magazine, 5-9 (1829-33) ; Edinburgh Journal of Natural and Geographical Science, 1 (1830) ; Annales des Sciences Naturelles, sér. 1, 18 (1829) ; Flora oder Botanische Zeitung, 1829-30 ; Literaturberichte zur Flora oder allgemeinen botanischen Zeitung, 1832 ; Botanische Literatur-Blätter . . . von der Königl. botanischen Gesellschaft zu Regensburg, 2 (1829) ; Linnaea, 5-9 (1830-34) ; Wikström, Jahresbericht der Schwed. Akad. Wiss. über die Fortschritte der Botanik im Jahre 1829 (1834) ; et op. cit. 1830 (1834) ; 1832 (1835) ; 1833 (1835) ; 1834 (1836).

The evidence as to the date of publication of part 1 is slightly conflicting. According to Linnaea, 5, Litt.-Ber. 175-177 (1830), it appeared in 1828, but the date 1829 is given both in Ann. Sci. Nat. 18, Rev. Bibl. 70 (1829), and in Wikström, Jahresb. Bot. 1829, 64 (1834), and the more precise date "April 1829," supplied in Bot. Lit.-Blätter, 2, 125 (1829), is accordingly accepted here as correct.

Hooker's original intention was to publish the "Botanical Miscellany" in quarterly parts, as is indicated in Ann. Sci. Nat. (l.c.), Wikström, Jahresb. Bot. (l.c.), Loud. Gard. Mag. 5, no. 20, 303 (1829), and Loud. Mag. Nat. Hist. 6, no. 33, 264 (May 1833), but the financial support required for a quarterly issue was not forthcoming, and the work seems to have been issued at approximately half-yearly intervals (see below), the ninth and concluding part appearing in March 1833 (Loud. Gard. Mag. 9, 349 : 1833). Publication was discontinued owing to lack of support by the botanical public. The price of each part, containing on the average over 120 pages of letterpress and (in the early parts) 25 plates, was only 15/- coloured, 10/6 plain (Loud. Gard. Mag. 5, 303), but the number of copies sold was apparently insufficient to meet the cost of publication. Hooker accordingly brought out a "second series" of the "Botanical Miscellany" in a less expensive form, under the title "The Journal of Botany," each part, price 7/6, containing six sheets of letterpress and 8 plates (see wrapper of Curtis's Botanical Magazine for April 1st, 1834).

Part 2 of the "Botanical Miscellany" appeared in September 1829† and part 3 in the early part of 1830. A review of vol. 1, given

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\* 30 new genera and 1 new generic name, 428 new species, and 23 new combinations and names of species.

† It is reviewed as "Part 2 for September" in Loud. Gard. Mag. 6, no. 28, Oct. 1830, 564. This must have been Sept. 1829, since Part 2 was reviewed in Edinb. Journ. Nat. Geogr. Sci. 1, 438 (March 1830).

in the "Edinburgh Journal of Natural and Geographical Science" for March 1830, mentions part 3 as unpublished but gives a full summary of its contents. It was reviewed in "Flora" on 21 July, 1830. Part 4 was published after 22 October, 1830, since it contains an obituary notice of Robert Barclay, who died on that date. The notice was written in 1830\* by Hooker, who refers to Barclay's death as "recent." As it was contained in the last sheet of part 4, it is probable that that part appeared in November or December 1830. Parts 5 and 6 appeared in 1831, according to *Literaturberichte zur Flora* 1832, 2, 32, the months of publication not being stated. The date of publication of part 7 has not been ascertained with certainty. It probably appeared in the spring of 1832, since it is not mentioned in *Loud. Gard. Mag.* 8, no. 37 (April 1832), 204, where parts 5 and 6 are reviewed, and we know that part 8 was published on 1 August, 1832. Part 9 appeared on 1 March, 1833 (*Loud. Gard. Mag.* 9, 349 : 1833).†

Taking all the ascertained facts together, it seems reasonable to conclude that two parts of the "Botanical Miscellany" appeared per annum, in spring and autumn respectively. The dates of publication of the nine parts may accordingly be stated as follows :

Part 1, April 1829 ; part 2, September 1829 ; part 3, spring or summer 1830.—vol. 1, dated 1830.

Part 4, after 22 Oct. 1830 ; part 5, [spring ?] 1831 ; part 6, [autumn ?] 1831.—vol. 2, dated 1831.

Part 7, [spring ?] 1832 ; part 8, 1 Aug. 1832 ; part 9, 1 March 1833.—vol. 3, dated 1833.

The precise contents and the dates of publication of each of the nine parts are given below, followed by references to the sources of information in each case.

#### VOLUME 1 (title-page dated 1830).

Part 1, pp. 1-96, tt. i-xxv : April 1829.—*See* *Loud. Mag. Nat. Hist.* 2, no. 7, May 1829, 193 ; *Ann. Sci. Nat.* 18, Rev. Bibl., Juin 1829, 70 ; *Flora oder Bot. Zeit.* 1829, 1, 184 [date given as Jan. 1829, but the Part was apparently not seen by the writer, who erroneously gave the title as "Miscellanea Botanica"] ; *Bot. Lit.-Blatter*, 2, 125, 226 (1829) ; *Edinb. Journ. Nat. Geogr. Sci.* 1, 438 (1830) ; *Linnaea*, 5, Litt.-Ber. 175 (1830) ; *Wikström, Jahresb. Bot.* 1829, 64 (1834).

Part 2, pp. 95 bis—236, tt. xxvi-1 : September 1829.—*See* *Edinb. Journ. Nat. Geogr. Sci.* 1, 438 (1830) ; *Loud. Gard. Mag.* 6 no. 28, October 1830, 564 ; *Linnaea*, 6, Litt.-Ber. 151 (1831) ; *Wikström, Jahresb. Bot.* 1829, 65 (1834).

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\* "In the summer of the present year his strength began to decline" Hooker in *Hook. Bot. Misc.* 2, 125.

† The less precise date "early in April" is given in *Loud. Mag. Nat. Hist.* 6, 264 (1833).

Part 3, pp. 237–356, tt. li–lxxv : spring or summer 1830.—*See* Edinb. Journ. Nat. Geogr. Sci. 1, 437 (“Part 3 unpublished”), 439 (March 1830) ; *Flora oder Bot. Zeit.* 1830, 2, 440 (21 Juli 1830) ; *Linnaea*, 6, Litt.-Ber. 151 (1831) ; *Wikström, Jahresb. Bot.* 1830, 86 (1834).

#### VOLUME 2 (title-page dated 1831).

Part 4, pp. 1–128, suppl. tt. i–x : after October 22, 1830.\*—*See* *Wikström, Jahresb. Bot.* 1832, 80 (1835).

Part 5, pp. 129–256, tt. lxxvi–xcv : [spring ?] 1831.—*See* *Loud. Gard. Mag.* 8, no. 37, April 1832, 204 ; *Literaturberichte zur Flora oder allg. bot. Zeit.* 1832, 2, 32 ; *Wikström, Jahresb. Bot.* 1832, 85 (1835).

Part 6, pp. 257–416, suppl. tt. xi–xix : [autumn ?] 1831.—*See* *Loud. Gard. Mag.* 8, no. 37, April 1832, 204 ; *Literaturberichte zur Flora oder allg. bot. Zeit.* 1832, 2, 32 ; *Wikström, Jahresb. Bot.* 1832, 88 (1835).

#### VOLUME 3 (title-page dated 1833).

Part 7, pp. 1–128, suppl. tt. xxi–xxxii : [spring ?] 1832.—*See* *Wikström, Jahresb. Bot.* 1832, 88 (1835).

Part 8, pp. 129–256, tt. xcvi–cxii : 1 August 1832.—*See* *Lindley in Bot. Reg.* 18, sub t. 1545, in adnot. (December 1, 1832) ; *Loud. Gard. Mag.* 8, no. 41, Dec. 1832, 712 ; *Wikström, Jahresb. Bot.* 1832, 89 (1835).

Part 9, pp. 257–390, suppl. tt. xxxiii–xli : 1 March 1833.—*See* *Loud. Mag. Nat. Hist.* 6, no. 33, May 1833, 264 ; *Loud. Gard. Mag.* 9, no. 44, June 1833, 349 ; *Linnaea*, 9, Litt.-Ber. 100 (1835) ; *Wikström, Jahresb. Bot.* 1834, 107 (1836).

“Suppl. tab. xx” appears never to have been published, the last plate of the supplementary series in vol. 2 being numbered xix and the first plate in vol. 3 “Suppl. tab. xxi.”

A list of the new genera and species described in the “Botanical Miscellany,” and of the new names and combinations, is given below. New generic names are printed in clarendon type. The dates of publication can be ascertained on reference to the list of parts.

#### FUNGI

*Cyclomyces* Kunze ex Hook. 2, 150.†  
*Cyclomyces fusca* Kunze ex Hook. 2, 150.†  
*Simblum periphragmoides* Klotzsch 2, 164.  
*Thelephora Kunzii* Hook. 2, 163.§

#### HEPATICAE

*Jungermannia Berteroana* Hook. 2, 148.  
*Monoclea crispata* Hook. 1, 117.

#### MUSCI

*Brachymenium pulchrum* Hook. 1, 136.  
*Bryum giganteum* Hook. 1, 37.  
 „ *Gilliesii* Hook. 1, 3.  
 „ *Menziesii* Hook. 1, 36.  
*Dicranum phascoides* Hook. 1, 39.  
*Gymnostomum amblyophyllum* Gill. et Hook.  
 1, 352.  
 „ *Wilsoni* Hook. 1, 143.

\* An obituary notice of Robert Barclay, who died on 22nd Oct. 1830, is given on pp. 122–125. The introduction to Wight's “Illustrations of Indian Botany” is dated 20th October, 1830 (p. 97).

† Names published previously by Fries in *Linnaea*, 5, 512 (1830).

§ Published previously under the name *Thelephora luteo-badia* by Fries, l.c. 526.

*Nechera Douglasii* Hook. 1, 131.  
*Phascum tetragonum* Hook. 1, 124 : erroneously attributed to Harvey in Ind. Bryolog. Ed. 2, 4, 354.

*Scouleria* Hook. 1, 33, gen. nov. (Grimmiaceae).

*Scouleria aquatica* Hook. 1, 33.

*Weissia reticulata* Hook. 1, 121.

#### FILICES

*Angiopteris longifolia* Grev. et Hook. 3, 227.

*Botrychium subcarnosum* Wall. 3, 222.

*Cryptogramma retrofracta* Grev. et Hook. 3, 385.

*Ophioglossum parvifolium* Grev. et Hook. 3, 218.

" *Wightii* Hook. et Grev. 3, 218.

*Osmunda Hilsenbergii* Hook. et Grev. 3, 230.

" *pilosa* Wall. 3, 229.

" *speciosa* Wall. 3, 230.

*Polypodium flaccidum* Wall. 2, 363.

" *fulvescens* Hook. et Grev. 2, 239.

" *gracile* Hook. et Grev. 2, 239.

" *melanopum* Grev. et Hook. 3, 384.

" *stipitatum* Hook. et Grev. 2, 239.

#### LYCOPODIACEAE

*Lycopodium affine* Hook. et Grev. 2, 364.

" *aloifolium* Wall. 2, 367.

" *anomalum* Hook. et Grev. 2, 400.

" *argenteum* Wall. 2, 384.

" *brachystachyum* Hook. et Grev. 3, 107.

" *brevifolium* Hook. et Grev. 3, 104.

" *calostachyum* Hook. et Grev. 3, 108.

" *caulescens* Wall. 2, 382.

" *chrysocaulon* Hook. et Grev. 2, 401.

" *cochleatum* Hook. et Grev. 2, 395.

" *crassicaule* Hook. et Grev. 2, 382.

" *dilatatum* Hook. et Grev. 2, 394.

" *divaricatum* Wall. 2, 377.

" *Douglasii* Hook. et Grev. 2, 396 : *L. ovalifolium* Hook. et Grev. Ic. Fil. t. 177 (1831), non Desv. (1813).

*Lycopodium fissidentoides* Hook. et Grev. 2, 395.

" *inaequalifolium* Hook. et Grev. 2, 391.

" *integerrimum* Hook. et Grev. 2, 396.

" *latifolium* Hook. et Grev. 2, 386.

" *lepidophyllum* Hook. et Grev. 3, 106.

" *longipes* Hook. et Grev. 2, 372.

" *Lyallii* Hook. et Grev. 2, 387.

" *Macraei* Hook. et Grev. 3, 108.

" *Menziesii* Hook. et Grev. 2, 390 : *L. arbuscula* Kaulf.

sec. Hook. et Grev. Ic. Fil. t. 200 (1831), non Kaulf. (1824).

" *nitidum* Hook. et Grev. 2, 397.

" *ornatum* Hook. et Grev. 3, 108.

" *pallidum* Hook. et Grev. 2, 389.

" *Parkeri* Hook. et Grev. 2, 388.

" *Poeppigianum* Hook. et Grev. 2, 393.

" *praelongum* Hook. et Grev. 3, 107.

" *Preslii* Hook. et Grev. 2, 377 : *L. serpens* Presl, Rel. Haenk. 81 (1825-36), non Desv. (1813).

" *protensum* Hook. et Grev. 3, 105 : *L. verticillatum* Linn. sec. Hook. et Grev. in Hook Bot. Misc. 2, 367 (1831), nomen.

" *pubescens* Wall. 2, 383.

" *pulvinatum* Hook. et Grev. 2, 381.

" *radicatum* Hook. et Grev. 2, 397.

" *reticulatum* Hook. et Grev. 2, 402.

" *Roxburghii* Hook. et Grev. 2, 390.

" *semicordatum* Wall. 2, 396.

" *subdiaphanum* Wall. 2, 401.

" *tenerum* Hook. et Grev. 2, 400.

" *tetragonostachyum* Wall. 2, 389.

" *vernicosum* Hook. et Grev. 2, 364.

" *Wallichii* Hook. et Grev. 2, 384.

" *Wightianum* Wall. 2, 379.

#### PHANEROGANAE

*Acacia adenopa* Hook. et Arn. 3, 206.

" *Aroma* Gill. 3, 206.

" *bonariensis* Gill. 3, 207.

- Acacia Bonplandii* Gill. ex Hook. 3, 205.  
 " *furcata* Gill. 3, 206.  
 " *lepidota* Hook. et Arn. 3, 205.  
 " *Sprengelii* Hook. et Arn. -3, 205 :  
   *A. incana*, Spreng. Syst. 3, 137 (1826).  
*Acaena caespitosa* Gill. 3, 307.  
 " *cuneata* Hook. et Arn. 3, 307.  
 " *integerrima* Gill. 3, 306.  
 " *splendens* Hook. et Arn. 3, 306.  
**Adenocaulon** Hook. 1, 19, gen. nov. (Compositae).  
*Adenocaulon bicolor* Hook. 1, 19.  
*Adesmia aspera* Gill. 3, 190.  
 " *bracteata* Hook. et Arn. 3, 193.  
 " *coluteoides* Gill. 3, 190.  
 " *coronilloides* Gill. 3, 190.  
 " *Gilliesii* Hook. et Arn. 3, 188.  
 " *grandiflora* Gill. 3, 190.  
 " *horrida* Gill. 3, 191.  
 " *leiocarpa* Hook. et Arn. 3, 189.  
 " *Loudonia* Hook. et Arn. 3, 193.  
 " *mucronata* Hook. et Arn. 3, 189.  
 " *pedicellata* Hook. et Arn. 3, 191.  
 " *pinifolia* Gill. 3, 192.  
 " *retrofracta* Hook. et Arn. 3, 188.  
 " *trifoliolata* Gill. 3, 194.  
 " *trijuga* Gill. 3, 191.  
 " *uspallatensis* Gill. 3, 192.  
 " *viscosa* Gill. 3, 192.  
*Alstroemeria dulcis* Hook. 2, 237.  
*Alternanthera nigriceps* Hook. 2, 237.  
*Apium chilense* Hook. et Arn. 3, 353.  
*Arenaria andicola* Gill. 3, 148.  
 " *bonariensis* Gill. 3, 148.  
*Argemone rosea* Hook. 2, 207.  
*Arum crenatum* Wight, 2, 100.  
*Asteriscium isatidicarpum* Hook. et Arn. 3, 349 : *Mulinum isatidicarpum* DC.  
*Asteriscium polycephalum* Gill. et Hook. 1, 332.  
*Astragalus Benthamianus* Gill. 3, 187.  
 " *complicatus* Gill. 3, 187.  
*Astrephia laxa* Hook. et Arn. 3, 364 :  
   *Fedia laxa* Hook. et Arn.  
*Astrephia lobata* Hook. et Arn. 3, 364.  
*Atropa glandulosa* Hook. 2, 230.  
 " *rhomboidea* Gill. et Hook. 1, 135.  
*Azara Gilliesii* Hook. et Arn. 3, 144.  
*Azorella Gilliesii* Hook. et Arn. 3, 347 :  
   *Bolax Gilliesii* Hook.  
*Banisteria bonariensis* Hook. et Arn. 3, 157.  
*Berberis chilensis* Gill. 3, 135.  
 " *corymbosa* Hook. et Arn. 3, 135.  
 " *Grevilleana* Gill. 3, 136.  
*Betckea Gilliesii* Hook. et Arn. 3, 366.  
*Bigelovia eryngioides* Hook. et Arn. 3, 360 : *Borreria eryngioides* Cham. et Schlecht.  
*Bolax Gilliesii* Hook. 1, 325.  
*Bowlesia tropaeolifolia* Gill. et Hook. 1, 325.  
**Bridgesia** Hook. 2, 222, gen. nov. (Compositae)—now reduced to *Polyachyrus* Lag. (1811).  
*Bridgesia echinopsoides* Hook. 2, 222.  
**Bridgesia** Hook. et Arn. 3, 168, gen. nov. (Rutaceae)—now reduced to *Ercilla* A. Juss. (Phytolaccaceae).  
*Bridgesia spicata* Hook. et Arn. 3, 169.  
*Bryonia tenuifolia* Gill. 3, 323.  
*Bunchosia multiflora* Hook. et Arn. 3, 157.  
*Byttneria heterophylla* Hook. 1, 291.  
*Cadaba triphylla* Wight, 3, 296.  
*Caiophora coronata* Hook. et Arn. 3, 327 :  
   *Loasa coronata* Gill. ex Arn.  
*Calandrinia andicola* Gill. 3, 332.  
 " *capitata* Hook. et Arn. 3, 334.  
 " *Cumingii* Hook. et Arn. 3, 334.  
 " *denticulata* Gill. 3, 333.  
 " *Gilliesii* Hook. et Arn. 3, 333.  
 " *ramosissima* Hook. et Arn. 3, 334.  
 " *sericea* Hook. et Arn. 3, 334.  
 " *trifida* Hook. et Arn. 3, 333.  
**Camptosema** Hook. et Arn. 3, 200, gen. nov. (Leguminosae).  
*Camptosema rubicundum* Hook. et Arn. 3, 201.  
*Canavalia paranensis* Hook. et Arn. 3, 200.  
*Cardamine affinis* Hook. et Arn. 3, 137.  
 " *angulata* Hook. 1, 343.  
 " *nivalis* Gill. ex Hook. 3, 136.  
*Cardiospermum velutinum* Hook. et Arn. 3, 158.  
*Cassia Arnottiana* Gill. 3, 211.  
 " *Cruckshanksii* Hook. et Arn. 3, 210.  
 " *Cumingii* Hook. et Arn. 3, 211.  
 " *Hookeriana* Gill. 3, 210.  
**Castanospermum** A. Cunn. 1, 241, gen. nov. (Leguminosae).  
*Castanospermum australe* A. Cunn. et Fraser, 1, 241.  
*Castela Nicholsoni* Hook. 1, 271.  
*Celastrus rhombifolius* Hook. et Arn. 3, 171.  
*Chenopodium paniculatum* Hook. 2, 237.  
*Cissus bonariensis* Hook. et Arn. 3, 159.  
 " *deficiens* Hook. et Arn. 3, 160.  
 " *serratifolia* Rottl. ex Wight, 2, 104.  
**Codonocarpus** A. Cunn. ex Hook. 1, 244, pro syn. : *Gyrostelemon* Desf. (Phytolaccaceae).

*Codonocarpus australis* A. Cunn. 1, 244.  
*Colletia cruciata* Gill. et Hook. 1, 152.  
 „ *ferox* Gill. et Hook. 1, 154.  
 „ *longispina* Hook. et Arn. 3, 173.  
 „ *ulicina* Gill. et Hook. 1, 155.  
*Colliguaja integerrima* Gill. et Hook. 1, 140.  
 „ *salicifolia* Gill. et Hook. 1, 141.  
 „ *triquetra* Gill. et Hook. 1, 142.  
*Colobanthus aretioides* Gill. ex Hook. 3, 336.  
*Cologania heterophylla* Gill. ex Hook. 3, 181.  
*Combretum Heynianum* Wall. 3, 86.  
*Convolvulus munitus* Wall. 2, 104.  
*Cornidia integerrima* Hook. et Arn. 3, 344.  
 „ *serratifolia* Hook. et Arn. 3, 344.  
*Corrigiola squamosa* Hook. et Arn. 3, 337.  
*Cranitzia attenuata* Hook. et Arn. 3, 346.  
*Cremolobus linearifolius* Hook. et Arn. 3, 138.  
*Cristaria dissecta* Hook. et Arn. 3, 153.  
 „ *eriantha* Hook. et Arn. 3, 152.  
 „ *heterophylla* Hook. et Arn. 3, 153 : *Sida heterophylla* Cav.  
*Crotalaria digitata* Hook. 2, 354.  
**Cruckshanksia** Hook. 2, 211, gen. nov. (Geraniaceae)—now reduced to *Balbisia* Cav. (1804)  
*Cruckshanksia cistiflora* Hook. 2, 211.  
**Cruckshanksia** Hook. et Arn. 3, 361, gen. nov. (Rubiaceae).  
*Cruckshanksia hymenodon* Hook et Arn. 3, 361.  
**Cryptopetalum** Hook. et Arn. 3, 344, gen. nov. (Saxifragaceae)—now reduced to *Lepuropetalum* Eil. (1817).  
*Cryptopetalum pusillum* Hook. et Arn. 3, 345.  
*Cucurbita asperata* Gill. 3, 324.  
*Cupania uraguensis* Hook. et Arn. 3, 159.  
*Cuphea glabra* Gill. ex Hook. et Arn. 3, 314.  
*Dalea cylindrica* Hook. 2, 213.  
 „ *elegans* Gill. ex Hook. 3, 183.  
*Desmodium cuneatum* Hook. et Arn. 3, 195.  
 „ *limense* Hook. 2, 215.  
**Dipyrena** Hook. 1, 355 : *Wilsonia* Gill. et Hook. (1830), non R.Br. (1810).  
*Dipyrena glaberrima* Hook. 1, 355 : *Wilsonia glaberrima*.  
**Discaria** Hook. 1, 156, gen. nov. (Rhamnaceae).  
*Discaria americana* Gill. ex Hook. 1, 156.  
 „ *australis* Hook. 1, 157, in adnot. : *Colletia pubescens* Brongn.  
*Draba Gilliesii* Hook. et Arn. 3, 137.  
*Dracocephalum erectum* Royle ex Benth. 3, 380.

*Elatine ambigua* Wight, 2, 103.  
*Epilobium puberulum* Hook. et Arn. 3, 309.  
*Eremostachys superba* Royle ex Benth. 3, 381.  
**Erianthera** Benth. 3, 380, gen. nov. (Labiatae)—now reduced to *Lamium* L. (1753).  
*Erianthera rhomboidea* Benth. 3, 380.  
*Eryngium anomalum* Hook. et Arn. 3, 350.  
 „ *bupleuroides* Hook. et Arn. 3, 352.  
 „ *coronatum* Hook. et Arn. 3, 350.  
 „ *depressum* Hook. et Arn. 3, 351.  
 „ *divaricatum* Hook. et Arn. 3, 350.  
 „ *flaccidum* Hook. et Arn. 3, 350.  
 „ *nudum* Gill. et Hook. 1, 334.  
 „ *sarcophyllum* Hook. et Arn. 3, 352.  
*Erysimum pusillum* Gill. 3, 140.  
*Escallonia Calcottiae* Hook. et Arn. 3, 342.  
 „ *Grahamiana* Gill. ex Hook. et Arn. 3, 343.  
 „ *macrantha* Hook. et Arn. 3, 341.  
*Eugenia affinis* Gill. 3, 321.  
 „ *Bridgesii* Hook. et Arn. 3, 322.  
 „ *correaefolia* Hook. et Arn. 3, 319.  
 „ *Cruckshanksii* Hook. et Arn. 3, 321.  
 „ *Cumingii* Hook. et Arn. 3, 319.  
 „ *elliptica* Hook. et Arn. 3, 323.  
 „ *ferruginea* Hook. et Arn. 3, 319.  
 „ *Gilliesii* Hook. et Arn. 3, 320.  
 „ *multiflora* Hook. et Arn. 3, 322.  
 „ *ovata* Hook. et Arn. 3, 319.  
 „ *planipes* Hook. et Arn. 3, 323.  
 „ *Selkirkii* Hook. et Arn. 3, 318.  
 „ *stenophylla* Hook. et Arn. 3, 322.  
 „ *Tweediei* Hook. et Arn. 3, 323.  
 „ *Ugni* Hook. et Arn. 3, 318 : *Myrtus Ugni* Mol.  
*Fagonia chilensis* Hook. et Arn. 3, 165.  
*Galactia stenophylla* Hook. et Arn. 3, 182.  
*Galium Chamissonis* Hook. et Arn. 3, 363.  
 „ *Gilliesii* Hook. et Arn. 3, 364.  
 „ *suffruticosum* Hook. et Arn. 3, 363.  
*Gayophytum micranthum* Hook. et Arn. 3, 311 : *Oenothera micrantha* Presl.  
*Genista andicola* Gill. ex Hook. et Arn. 3, 178.  
 „ *Cumingii* Hook. et Arn. 3, 178.  
 „ *elegans* Gill. ex Hook. et Arn. 3, 178.  
 „ *rigida* Gill. ex Hook. et Arn. 3, 178.  
*Gentiana incurva* Hook. 2, 228.  
 „ *thyrsoides* Hook. 2, 227.  
*Glycosmis triphylla* Wight, 3, 298.



- Glycyrrhiza astragalina* Gill. 3, 183.  
*Gongora macrantha* Hook. 2, 151.  
*Gouania ulmifolia* Hook. et Arn. 3, 174.  
*Gourliea* Gill. ex Hook. 3, 207, gen. nov. (Leguminosae).  
*Gourliea decorticans* Gill. ex Hook. 3, 208.  
*Grahamia* Gill. apud Hook. et Arn. 3, 331, gen. nov. (Portulacaceae).  
*Grahamia bracteata* Gill. 3, 332.  
*Guildingia* Hook. 1, 122, gen. nov. (Melastomataceae)—now reduced to *Mouriria* Juss. (1789) or to *Olisbea* DC. (1828).  
*Guildingia psidioides* Hook. 1, 122.  
*Guindilla* Gill. ex Hook. et Arn. 3, 170, gen. nov. (Rutaceae)—now reduced to *Valenzuela* Bert. (Sapindaceae).  
*Guindilla trinervis* Gill. 3, 170.  
*Gyrostemon attenuatum* Hook. 1, 243, in adnot.  
*Hedyotis perpusilla* Hook. et Arn. 3, 359.  
*Herniaria setigera* Gill. 3, 337.  
*Heteropteris glabra* Hook. et Arn. 3, 157.  
*Hexaptera* Hook. 1, 350, gen. nov. (Cruciferae).  
*Hexaptera cuneata* Gill. et Hook. 1, 352.  
" *pinnatifida* Gill. et Hook. 1, 350.  
" *spathulata* Gill. et Hook. 1, 351.  
*Hibiscus angustifolius* Hook. et Arn. 3, 152.  
*Hoffmanseggia gracilis* Hook. et Arn. 2, 209.  
*Holboellia* Wall. ex Hook. 2, 144, gen. nov. (Gramineae)—now reduced to *Lopholepis* Decne. (1839).  
*Holboellia ornithocephala* Hook. 2, 144.  
*Homalocarpus* Hook. et Arn. 3, 348, gen. nov. (Umbelliferae)—now reduced to *Bowlesia* Ruiz et Pav. (1794).  
*Homalocarpus bowlesiioides* Hook. et Arn. 3, 348.  
*Inga parvifolia* Hook. et Arn. 3, 202.  
" *uraguensis* Hook. et Arn. 3, 202.  
*Ionidium diffusum* Gill. ex Hook. 3, 145.  
*Ipomoea punctata* Macfad. 2, 116.  
*Jaborosa caulescens* Gill. et Hook. 1, 347.  
*Jussieua bracteata* Hook. et Arn. 3, 313.  
" *hexapetala* Hook. et Arn. 3, 312.  
" *multinervia* Hook. et Arn. 3, 312.  
" *stenophylla* Gill. 3, 312.  
*Lamium petiolatum* Royle ex Benth. 3, 381.  
*Lamourouxia bartsiioides* Hook. 2, 234.  
*Laretia* Gill. et Hook. 1, 329, gen. nov. (Umbelliferae).  
*Laretia acaulis* Gill. et Hook. 1, 329.  
*Lathyrus crassipes* Gill. ex Hook. et Arn. 3, 198.  
" *macropus* Gill. ex Hook. et Arn. 3, 198.  
*Lewisia rediviva* Pursh var.  $\beta$  Hook. 1, 345.  
*Limonia missionis* Wall. 3, 291.  
*Lithrea caustica* Hook. et Arn. 3, 175 :  
*Laurus caustica* Mol.  
*Loasa dissecta* Hook. et Arn. 3, 330.  
" *elongata* Hook. et Arn. 3, 329.  
" *floribunda* Hook. et Arn. 3, 329.  
" *heterophylla* Hook. et Arn. 3, 328.  
" *sagittata* Hook. et Arn. 3, 328.  
*Loranthus Berteri* Hook. et Arn. 3, 357.  
" *uraguensis* Hook. et Arn. 3, 358.  
*Lupinus albescens* Hook. et Arn. 3, 201.  
" *andicola* Gill. 3, 201.  
" *aureo-nitens* Gill. 3, 201.  
*Macraea crenata* Hook. 1, 177.  
*Malva geranioides* Gill. ex Hook. 3, 152.  
" *glomerata* Hook. et Arn. 3, 151.  
" *humilis* Gill. 3, 150.  
" *peduncularis* Hook. et Arn. 3, 150.  
" *sulphurea* Gill. 3, 149.  
" *tenuifolia* Hook. et Arn. 3, 150.  
*Margyricarpus alatus* Gill. ex Hook. et Arn. 3, 305.  
*Marmoritis* Benth. 3, 377, gen. nov. (Labiateae)—now reduced to *Nepeta* L. (1753).  
*Marmoritis rotundifolia* Benth. 3, 377.  
*Mathewsia* Hook. et Arn. 3, 140, gen. nov. (Cruciferae).  
*Mathewsia foliosa* Hook. et Arn. 3, 140.  
*Menyanthes Crista-Galli* Menz. ex Hook. 1, 45.  
*Microcarpaea spathulata* Hook. 2, 101 :  
*Limosella diandra* L.  
*Mimosa adpressa* Hook. et Arn. 3, 202.  
" *uraguensis* Hook. et Arn. 3, 202.  
*Misodendron microphyllum* Hook. et Arn. 3, 357.  
*Momordica Hystrix* Gill. 3, 324.  
*Mucuna prurita* Hook. 2, 348.  
*Mulinum alboginatum* Gill. et Hook. 1, 328.  
" *ulicinum* Gill. et Hook. 1, 328.  
*Mutisia linifolia* Hook. 1, 12.  
*Myriophyllum proserpinacoides* Gill. ex Hook. et Arn. 3, 313.  
*Myrtus fernandeziana* Hook. et Arn. 3, 316.  
" *stipularis* Hook. et Arn. 3, 316.  
*Nepeta clinopodioides* Royle ex Benth. 3, 379.

- Nepeta connata* Royle ex Benth. 3, 378.  
 " *discolor* Royle ex Benth. 3, 378.  
 " *distans* Royle 3, 379.  
 " *elata* Royle ex Benth. 3, 378.  
 " *elliptica* Royle 3, 378.  
 " *linearis* Royle ex Benth. 3, 377.  
 " *nervosa* Royle ex Benth. 3, 378.  
 " *polystachya* Royle ex Benth. 3, 378.  
 " *salviaefolia* Royle ex Benth. 3, 379.  
*Oenothera mendocinensis* Gill. ex Hook. et Arn. 3, 310.  
*Origanum laxiflorum* Royle ex Benth. 3, 376.  
*Orthosiphon pallidus* Royle ex Benth. 3, 370.  
*Oxalis adenophylla* Gill. 3, 165.  
 " *andicola* Gill. 3, 161.  
 " *compacta* Gill. 3, 162.  
 " *erythrorhiza* Gill. 3, 162.  
 " *geminata* Hook. et Arn. 3, 163.  
 " *lineata* Gill. 3, 162.  
 " *macrorrhiza* Gill. 3, 162.  
 " *platypila* Gill. 3, 163.  
 " *subacaulis* Gill. 3, 163.  
*Oxleya* A. Cunn. 1, 246, gen. nov. (Meliaceae)—now reduced to *Flindersia* R. Br. (1814).  
*Oxleya xanthoxyla* A. Cunn. 1, 246.  
*Panicum aristatum* Macfad. 2, 115.  
*Passiflora retusa* Hook. et Arn. 3, 325.  
*Pentacaena ramosissima* Hook. et Arn. 3, 338 : *Loeflingia ramosissima* Weinm.  
*Phaca Arnottiana* Gill. 3, 184.  
 " *canescens* Hook. et Arn. 3, 185.  
 " *carinata* Hook. et Arn. 3, 185.  
 " *coquimbensis* Hook. et Arn. 3, 184.  
 " *Cruckshanksii* Hook. et Arn. 3, 184.  
 " *elata* Hook. et Arn. 3, 185.  
 " *flava* Hook. et Arn. 3, 186.  
 " *inflata* Gill. 3, 183.  
 " *ochroleuca* Hook. et Arn. 3, 186.  
*Phaseolus amoenus* Macfad. 2, 113.  
 " *vestitus* Hook. 2, 216.  
*Phlomis bracteosa* Royle ex Benth. 3, 383.  
 " *cashmeriana* Royle ex Benth. 3, 382.  
 " *cordata* Royle ex Benth. 3, 382.  
 " *lamiifolia* Royle ex Benth. 3, 383.  
 " *latifolia* Royle ex Benth. 3, 383.  
 " *simplex* Royle ex Benth. 3, 382.  
*Plectrocarpa* Gill. ex Hook. et Arn. 3, 166, gen. nov. (Zygophyllaceae).  
*Plectrocarpa latracantha* Gill. 3, 167.  
*Pleurophora polyandra* Hook. et Arn. 3, 315.  
 " *pusilla* Hook. et Arn. 3, 315.  
*Poinciana Gilliesii* Hook. 1, 129.  
*Polygala spinescens* Gill. 3, 146.  
*Portulaca pilosissima* Hook. 2, 220.  
*Prenanthes subdentata* Hook. 2, 221.  
*Prosopis astringens* Gill. ex Hook. 3, 204.  
 " *ephedrioides* Gill. ex Hook. 3, 204.  
 " *globosa* Gill. ex Hook. 3, 205.  
 " *humilis* Gill. ex Hook. 3, 204.  
 " *sericantha* Gill. ex Hook. 3, 204.  
*Psidium amygdalinum* Hook. et Arn. 3, 317.  
*Psoralea Higerilla* Gill. ex Hook. 3, 181.  
*Psychotria pyrifolia* Hook. et Arn. 3, 360.  
 " *trifolia* Hook. et Arn. 3, 359.  
*Pyrenacantha volubilis* Wight 2, 107.  
*Ranunculus triseptatus* Gill. ex Hook. 3, 133.  
*Retanilla stricta* Hook. et Arn. 3, 173.  
 " *trinervia* Hook. et Arn. 3, 174 : *Trevoa trinervia* Gill. et Hook.  
*Rhexia heterophylla* Hook. et Arn. 3, 316.  
*Rhynchosia mendacinensis* Gill. ex Hook. et Arn. 3, 199.  
 " *Senna* Gill. ex Hook. et Arn. 3, 199.  
 " *sericea* Gill. ex Hook. et Arn. 3, 199.  
*Ribes cucullatum* Hook. et Arn. 3, 340.  
*Rubia Haenkeana* Gill. ex Hook. et Arn. 3, 363.  
 " *intricata* Hook. et Arn. 3, 362.  
 " *mucronata* Hook. et Arn. 3, 363 : *Galium mucronatum* Ruiz et Pav.  
 " *pusilla* Gill. ex Hook. et Arn. 3, 363.  
 " *Richardiana* Gill. ex Hook. et Arn. 3, 362.  
*Ruellia floribunda* Hook. 2, 236.  
*Sageretia trinervis* Gill. ex Hook. 3, 172.  
*Salvia hians* Royle ex Benth. 3, 373.  
 " *strictiflora* Hook. 2, 234.  
*Savothra Drummondii* Grev. et Hook. 3, 236.  
*Schinus ternifolius* Gill. ex Hook. 3, 177.  
*Senecio volubilis* Hook. 2, 226.  
*Seseli Gilliesii* Hook. et Arn. 3, 354.  
*Sicyos Baderoa* Hook. et Arn. 3, 324.  
*Sida Arnottiana* Gill. ex Hook. 3, 154.  
 " *ceratocarpa* Hook. et Arn. 3, 154.  
 " *densiflora* Hook. et Arn. 3, 155.  
 " *Grevilleana* Gill. ex Hook. 3, 154.  
 " *picta* Gill. ex Hook. 3, 154.  
*Silene andicola* Gill. 3, 147.  
*Sisymbrium Arnottianum* Gill. ex Hook. 3, 138.  
 " *frutescens* Gill. ex Hook. 3, 139.  
 " *leptocarpum* Hook. et Arn. 3, 139.  
 " *sagittatum* Hook. et Arn. 3, 139.

- Sisymbrium stenophyllum* Gill. ex Hook. 3, 139.  
*Solanum amblyophyllum* Hook. 2, 231.  
*Spathicarpa* Hook. 2, 146, gen. nov. (Araceae).  
*Spathicarpa hastifolia* Hook. 2, 147.  
*Stachys speciosa* Hook. 2, 235.  
*Stevia puberula* Hook. 2, 225.  
*Tetrastemon* Hook. et Arn. 3, 317, gen. nov. (Myrtaceae)—now reduced to *Myrrhinium* Schott. (1827).  
*Tetrastemon loranthoides* Hook. et Arn. 3, 318.  
*Teucrium nudicaule* Hook. 2, 235.  
*Thlaspi andicola* Hook. et Arn. 3, 138.  
*Trevoa* Miers ex Hook. 1, 158, gen. nov. (Rhamnaceae).  
*Trevoa quinquenervia* Gill. et Hook. 1, 158.  
" *trinervia* Gill. et Hook. 1, 159.  
*Tricomaria* Gill. ex Hook. 3, 157, gen. nov. (Malpighiaceae).  
*Tricomaria Usillo* Hook. et Arn. 3, 158.  
*Trifolium Macraei* Hook. et Arn. 3, 179.  
" *microdon* Hook. et Arn. 3, 180.  
" *physanthum* Hook. et Arn. 3, 180.  
*Unxia dissecta* Hook. 2, 227.  
*Valeriana Bridgesii* Hook. et Arn. 3, 365.  
*Verbena aphylla* Gill. et Hook. 1, 161.  
" *asparagoides* Gill. et Hook. 1, 165.  
" *aspera* Gill. et Hook. 1, 163.  
" *caespitosa* Gill. et Hook. 1, 165.  
" *crithmifolia* Gill. et Hook. 1, 169.  
" *erinacea* Gill. et Hook. 1, 164.  
" *flava* Gill. et Hook. 1, 170.  
" *glauca* Gill. et Hook. 1, 163.  
" *gratissima* Gill. et Hook. 1, 160.  
" *intermedia* Gill. et Hook. 1, 166.  
" *juncea* Gill. et Hook. 1, 162.  
" *juniperina* Gill. et Hook. 1, 163.  
*Verbena radicans* Gill. et Hook. 1, 170.  
" *scoparia* Gill. et Hook. 1, 161.  
" *seriphoides* Gill. et Hook. 1, 164.  
" *spatulata* Gill. et Hook. 1, 162.  
" *teucrioides* Gill. et Hook. 1, 167.  
" *venosa* Gill. et Hook. 1, 167.  
*Vicia bidentata* Hook. 2, 215.  
" *bijuga* Gill. ex Hook. 3, 197.  
" *dentata* Gill. ex Hook. 3, 197.  
" *Macraei* Hook. et Arn. 3, 195.  
" *micrantha* Hook. et Arn. 3, 197 : *V. parviflora* Hook. et Arn.  
" *pallida* Hook. et Arn. 3, 196.  
*Vincetia* Boj. 1, 293, gen. nov. (Tiliaceae)—either reduced to *Grewia* L. (1753) or replaced by *Vinticina* Steud.  
*Vincetia triflora* Boj. 1, 293.  
*Viola Asterias* Hook. et Arn. 3, 145.  
" *congesta* Gill. 3, 144.  
" *pusilla* Hook. et Arn. 3, 145.  
" *volcanica* Gill. 3, 145.  
*Viscum ambiguum* Hook. et Arn. 3, 356.  
" *falcifrons* Hook. et Arn. 3, 358.  
" *Liga* Gill. ex Hook. et Arn. 3, 355.  
*Viviania crenata* G. Don ex Hook. 3, 149 : *Macraea crenata* Gill. et Hook.  
" *petiolata* Hook. et Arn. 3, 149.  
*Vohiria aphylla* Hook. 1, 46 : *Gentiana aphylla* Jacq.  
" *tenella* Guild. ex Hook. 1, 47.  
*Wiborgia oblongifolia* Hook. 2, 226.  
*Wilsonia* Gill. et Hook. 1, 172, gen. nov. (Verbenaceae), non R. Br. (1810) : renamed *Dipyrena* Hook. (1830), the generic name *Wilsonia* being pre-occupied.  
*Wilsonia glaberrima* Gill. et Hook. 1, 173.  
*Witheringia salicifolia* Hook. 2, 231.  
*Zanthoxylon Coco* Gill. ex Hook. et Arn. 3, 168.  
*Zygophyllum Retama* Gill. ex Hook. et Arn. 3, 166.

The dates hitherto assigned, in all botanical works of reference, to the following generic names are erroneous, being in each case one year later than the actual date of publication :

*Scouleria* Hook. (Grimmiaceae), *Adenocaulon* Hook. (Compositae), *Bridgesia* Hook. et Arn. (" Rutaceae "), *Camplosema* Hook. et Arn. (Leguminosae), *Discaria* Hook. (Rhamnaceae), *Gourliea* Gill. ex Hook. (Leguminosae), *Guildingia* Hook. (Melastomataceae), *Guindilia*, Gill. (Sapindaceae), *Mathewsia* Hook. et Arn. (Cruciferae), *Plectrocarpa* Gill. ex Hook. et Arn. (Zygophyllaceae), *Tricomaria* Gill. ex Hook. (Malpighiaceae), *Wilsonia*, Gill. et Hook. (Verbenaceae).

The generic name *Trevoa* (Rhamnaceae), cited from Miers, Trav.

Chile, 2, 529 (1826), appeared there as a *nomen nudum*. Actually the first description was published 3 years later by Hooker in Hook. Bot. Misc. 1, 158 (September 1829).

Wight's "Illustrations of Indian Botany," which appeared in Hook. Bot. Misc. 2, 90-110 (after 22 Oct., 1830), 344-360 (autumn? 1831), 3, 84-104 (spring? 1832), 291-302 (1 March, 1833), was reprinted, under the same title, at Glasgow (Curl & Bell), the title-page bearing the date 1831. This date evidently refers only to the first part of the reprint, which must necessarily have appeared in instalments. In the Bradley Bibliography, 1, 471, the date of the reprint is given as 1831 [-33]. The copy seen by Pritzels, Thesaurus, ed. 2, n. 10243 included pp. 1-70, tt. i-xix, xxi-xli, which originally appeared in the Botanical Miscellany during the period 1830-33. A copy, presented by George Bidie to Sir J. D. Hooker, and now in the Library of the Royal Botanic Gardens, Kew, ends with p. 58 and t. xxxii, the last instalment being missing. This shows that the title-page was issued before the completion of the reprint.

Advantage was taken, when reprinting, to adjust the text slightly. Thus the accounts of *Pterospermum suberifolium*, p. 45, *Bryophyllum calycinum*, p. 55, and *Butea frondosa*, p. 57, begin at the top of the page, instead of some distance down as in the "Botanical Miscellany," while the description of *Villarsia macrophylla*, pp. 51-52, and the general remarks, pp. 53-54, are adjusted so that the former ends at the bottom of p. 52, and the latter begin at the top of p. 53.

The continuation of the "Illustrations of Indian Botany" published in Hook. Journ. Bot. 1, 62-67, 225-231 (1834) does not appear to have been reprinted.

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## XII—THE FLORA OF THE PYRENEES ORIENTALES. NEW VARIETIES AND ADDITIONS. A. R. HORWOOD.

Amongst some plants collected in the Pyrénées Orientales by Mr. J. W. Wyatt, in the Vernet-les-bains district, between June and September, 1934, were two undescribed varieties, *Hypochoeris maculata* L. var. *runcinata* Horw., and *Hypericum montanum* L. var. *pilosum* Horw. Mr. Wyatt made his collection under difficulties, when only just recovering from an accident. It is therefore the more remarkable that he should have enriched the Kew Herbarium to the extent of over 350 specimens. Besides the new varieties here described, various other plants, rare or unknown in the Pyrénées Orientales, were found by Mr. Wyatt.

The following notes deal with variation in the two species concerned, and contain descriptions of the new varieties, followed by a list of other interesting plants found.

## VARIATION IN *HYPOCHOERIS MACULATA*

The typical leaf form of *Hypochoeris maculata*, as described by Linnaeus, Sp. Pl. 810, is not lobed, but merely toothed, the original description being "*Hypochaeris caule subnudo: ramo solitario foliis ovato-oblongis integris dentatis.*" Over wide areas this type is the usual one, and in Rouy et Foucaud, Flore de France, 10, 38 (1908), no variety is mentioned; but in montane and rocky areas there is considerable variation.

### I. Varieties based upon foliage characters.

1. var. **pinnatifida** (Uechtr.) Weiss in Koch, Syn. Deutsch. Fl. ed. 3 (Hallier uu. Wohlfarth), fasc. 11, 1623 (1900); F. N. Williams, Prodr. Fl. Brit. part 4, 187 (1903); Hegi, Ill. Fl. 6, pt. 2, 1010 (1928).—*Achyrophorus maculatus* (L.) Scop. var. *pinnatifidus* Uechtr. in Fiek, Fl. Schlesien, 252 (1881).
2. var. **oblongifolia** (DC.) K. Maly in Glasnik Zemaljsk. Muz. u. Bosni i Hercegov. 11, 147 (1899); Schinz et Thell. Fl. Schweiz, ed. 3, 2, 355 (1914); Hegi, l.c.—*Achyrophorus maculatus* (L.) Scop. var. *oblongifolius* DC. in DC. Prodr. 7, 93 (1838). *A. maculatus* var. *longifolius* G. Froel. ex Hegi, l.c. *Hypochoeris tyrolensis* Schiw. ex DC., l.c. *H. maculata* forma *tyrolensis* (Schiw.) Fiori, Fl. Anal. Ital. 3, 392 (1904).
3. var. **phyllocaulos** Metsch, Fl. Henneb. 317 (1845); et in Bot. Zeit. 10, 290 (1852); Hegi, l.c.
4. var. **Pelivanovicii** (Petrov.) Horw., comb. nov.—*Hypochoeris Pelivanovicii* Petrov. ex Velen. Fl. Bulgar. 361 (1891). *H. Pelivanovicii* var. *typica* K. Maly in Glasnik Zemaljsk. Muz. u. Bosni i Hercegov. 35, 135 (1923). *Hypochoeris maculata* subsp. *Pelivanovicii* (Petrov.) Hayek, Prodr. Fl. Penins. Balcan. 2, 809 (1931). *Hypochoeris macedonica* Form. in Verh. Nat. Ver. Brunn, 37, 159 (1898).
5. var. **illyrica** (K. Maly) Hayek, Prodr. Fl. Penins. Balcan. 2, 809 (1931).—*Hypochoeris illyrica* K. Maly, in Glasnik Zemaljsk. Muz. u. Bosni i Hercegov. 18, 447 (1906); Fedde, Repert. 6, 293 (1909). *Hypochoeris Pelivanovicii* var. *illyrica* K. Maly, l.c. 35, 135 (1923).
6. var. **koritnicensis** Dörfl. et Hayek in Osterr. Bot. Zeitschr. 70, 22 (1921).
7. var. **alpicola**\* (Schur) Horw., comb. nov.—*Achyrophorus maculatus* var. *alpicola* Schur, Enum. Pl. Transs. 365 (1866).
8. var. **alpestris** (Schur) Horw., comb. nov.—*Achyrophorus maculatus* var. *alpestris* Schur, l.c.

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\* Represented in Kew Herbarium.

9. var. **obtusifolia** (Schur) Horw., comb. nov. *Achyrophorus maculatus* var. *obtusifolius* Schur, l.c.

10. var. **ramosissima** (Schur) Horw., comb. nov. *Achyrophorus maculatus* var. *ramosissimus* Schur, l.c.

## II. Varieties based upon characters of the Capitula.

11. var. **citrina**\* K. Maly in Glasnik Zelmajsk. Muz. u. Bosni i Hercegov. 45, 102 (1933).

12. var. **uniflora**\* DC. Fl. Franc. 6, 451 (1815).—*Hypochoeris maculata* var. *simplex* Duby in DC. Bot. Gall. ed. 2, 1, 306 (1828). *Achyrophorus maculatus* (L.) Scop. var. *monocephalus* DC. in DC. Prodr. 7, 93 (1838). *Hypochoeris maculata* forma *monocephala*\* (DC.) Fiori, Fl. Anal. Ital. 3, 392 (1904).

13. var. **microcephala** (DC.) Horw., comb. nov.—*Achyrophorus maculatus* var. *microcephalus* DC. in DC. Prodr. 7, 93 (1838).

## III. Varieties based upon size.

14. var. **fallax**\* Murr ex Hegi, l.c.

The following is a description of the new variety:—

**Hypochoeris maculata** L. var. **runcinata** Horw., var. nov.; a typo habitu elatiore, caulibus altioribus ad 55 cm. altis ramosis, foliis longioribus ovatis vel lanceolatis runcinato-lobatis, scapo (in typo) ramoso 2–3-cephalo, flosculis citrino-luteis nec fuscis differt.

PYRÉNÉES ORIENTALES. Vernet-les-bains, 660 m., on a dry slope towards Fillols, 4.vi.1925, *Ellman & Sandwith* 43 (type); Py, 990 m., 25.vii.1934, *Wyatt* 224; Mont Louis, 17.viii.1934, *Wyatt* 198.

GREAT BRITAIN. Orme's Head, Caernarvonshire, July 1886, *Dr. Wood*; Lizard Head, Cornwall, 1890, *Fras. Jose*.

STYRIA. R. C. Prior, sine num.

The specimens collected at Vernet-les-bains (*Ellman & Sandwith* 43) in 1925 have typically runcinate leaves, as in many species of *Hieracium*. Those from Py (*Wyatt* 224) resemble *H. radicata* very closely in the marginal cutting of the leaves and in the size and habit, and it might be considered that *H. maculata* at that locality was tending towards *H. radicata*. There is, however, a difference in the capitula, bringing *H. maculata* into a separate section, *Achyrophorus*, with the pappus of the ray in one series, whereas in *Euhypochoeris*, including *H. radicata*, the pappus in the ray is in two series, with the inner series setiform, not all plumose as in *H. maculata*. British specimens from Orme's Head, collected July 1856 by *Dr. Wood*, and at the Lizard, Cornwall, collected in 1890 by *Fras. Jose*, also come under this variety. A separate note will be published

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\* Represented in Kew Herbarium.

on these plants elsewhere. A specimen from Boschetto, Trieste, collected 28.v.1864 by M. Trihoda, approaches this variety.

The affinity of this variety lies no doubt with var. *pinnatifida* Uechtr., but in this, as described by Weiss, in Koch, loc. cit., the basal leaves are pinnatifid, with linear-lanceolate sections or lobes. A figure of this variety, in Fl. Danica, t.901 (1787), named "*Leon-todon hirtum* Linn." by Müller, which is not based on either living or dried material seen by Vahl, is referred by Lange, Haandb. Dansk. Fl. ed. 3, 584 (1864), to *Hypochoeris maculata* var. *Muelleri*. This is treated as a synonym of var. *pinnatifida* by F. N. Williams, Prodr. Fl. Brit. 3, 187 (1902), and included as a British plant, but he cites no locality. He describes the leaves of *H. radicata* erroneously as "*sinuato-pinnatifida*" (ibid. 186).

The other variety related to var. *runcinata* is Schur's var. *ramosissima*, Enum. Pl. Transs. 365 (1866), in which the leaves are described as "*inciso-dentatis vel laceris*," the rest of the description not agreeing, however, with the characters of var. *runcinata*.

#### VARIATION IN *HYPERICUM MONTANUM*

In Europe, according to C. E. Britton, in Journ. Bot. 1926, 325, the common form of this species is var. *scabrum* Koch, with the leaves "*scurfy beneath*."

The varieties described by Hegi, Ill. Fl. 5, 525 (1825), include :—

var. *typicum* Beck (*H. elegantissimum* Crantz) with smooth foliage leaves, and forma *abbreviata* Reinecke, with the upper stem leaves broad, blunt-pointed.

var. *scabrum* Koch (var. *scaberulum* Beck), leaves scabrous beneath ;

var. *caucasicum* Parl., leaves without perforations or glands ;

var. *maculantherum* Sagorski, more glandular above.

De Candolle described a var. *triphyllum* with leaves in threes, not in pairs.

Rouy and Foucaud, Fl. de France, 3, 341 (1895), mention var. *typicum* Beck, and var. *scabrum* Koch, as found in France, while Fournier (Fl. Compl. Plaine Franc. 65, in adnot.) regards the former as the typical French form.

In none of the above varieties is the stem anything but glabrous and the leaves are either glabrous, glaucous or scabrous.

Mr. Wyatt collected in the Pyrénées Orientales a plant quite distinct from any of the above, and I here describe it as a new variety. Besides the Pyrenean specimen of this variety there are examples agreeing with it from Sweden and Germany. In both Swedish and German specimens the leaves are without marginal black glands, as in the Pyrenean example.

***Hypericum montanum* L. var. *pilosum* Horw., var. nov.; planta omnibus partibus minore, caulibus gracilioribus pilosis, foliis utrinque**

*pilosis nec scabris tenuioribus ovato-lanceolatis, subtus vix glaucis margine non atroglandulosis, floribus paucioribus a typo differt.*

PYRÉNÉES ORIENTALES. Vernet-les-bains, 900 m., 26.vii.1934, Wyatt 23 (type) (with var. *scabrum* Koch).

SWEDEN. Kullenberg, July 1869, "rare," F. Ahlberg.

GERMANY. In mountain woods, Hercynia, Alti Stelberg, 18.vii.1882, Beck (with var. *scabrum* Koch).

#### PLANTS RARE OR PREVIOUSLY UNNOTICED

Besides the above new varieties, Mr. Wyatt collected a plant unrepresented in the Kew Herbarium. It has been identified by description as follows:—

*Onopordon Gautieri* Rouy. apud Gautier in Bull. Soc. Bot. Fr. 38, sess. extr. p. xvi (1891), where it is recorded from Millas, collected by Gaston Gautier, 27 June, 1891. Rouy remarks that it is related only to *O. illyricum* L., or, in its form, to *O. horridum* Viv. Gautier in his herbarium had it under the name *O. nervosum*, but that name was preoccupied by a Spanish plant. Rouy says it is distinguished from the above species by the narrow involucre bracts of the smaller heads, the lower bracts erect, carinate, and the pappus twice as long as the cypselae.

Rouy suggested (l.c. 17) that this species might be found at Vernet-les-bains, where Mr. Wyatt collected it, in Aug. 1934 (no. 30), thus confirming Rouy's prediction. It grew at 810 m., only in one place, but was there plentiful.

The following species or varieties are not recorded by Gaston Gautier in his "Catalogue Raisonné de la Flore des Pyrénées-Orientales," 1898, though all but the three immediately following are recorded for France as a whole by Rouy and Foucaud.

*Aster alpinus* L. var. *Flahaulti* Sennen.—Canigou, 2400 m., 6.viii.1934, Wyatt no. 258.

*Artemisia scoparia* WK.—Vernet-les-bains, 690 m., 1.ix.1934, no. 331, doubtless an alien.

*Knautia purpurea* Vill.—Marialles, 1650 m., apparently an entire-leaved form of this, 15.viii.1934, no. 294.

*Potentilla argentea* L. var. *multifida* Tratt. (var. *tenuiloba* Jord.).—St. Martin, Vernet, 1050 m., 2.vii.1934, no. 48.

*Epilobium hirsutum* L. var. *villosissimum* Koch.—Villefranche, 450 m., 15.viii.1934, no. 286.

*Senecio adonidifolius* Lois, var. *platylobus* R. et F.—Canigou, 1200 m., 1.vii.1934, no. 27A.

*Hieracium umbellatum* L., subsp. *serotinum* Host.—Vernet-les-bains, 690 m., 23.viii.1934, no. 314.

*Hieracium pilosella* L. subsp. *velutinum* Heg. et Her.—Vernet-les-bains, 750 m., 30.vi.1934, no. 29; *ibid.* 900 m., 5.vii.1934, no. 78.

*Lactuca dubia* Jord. (*L. Scariola*, L., entire-leaved form).—Vernet-les-bains, 750 m., 21.viii.1934, no. 312.

*Linaria alpina* L. var. *unicolor* Gremli.—Canigou, 10.vii.1934, no. 142.



*Veronica officinalis* L. var. *Tournefortii* Reichb.—Glandular form, Mariailles, 1500 m., 15.viii.1934, no. 308.

*Euphrasia Willkommii* Freyn.—Vernet-les-bains, 810 m., 15.ix. 1934, no. 351 ; Mariailles, 1050 m., 15.viii.1934, no. 304.

*Lavandula officinalis* Chaix var. *pyrenaica* (DC.) Benth.—Tour de Goa, 1230 m., 15.vii.1934, no. 171 ; Villefranche, 435 m., 27.vii. 1934, no. 235.

*Lamium maculatum* L. var. *rugosum* (Ait.) Briq.—Vernet-les-bains, 750 m., 30.vi.1934, no. 2.

*Teucrium aureum* Schreb., var. *latifolium* Willk.—Vernet-les-bains, 900 m., 5.vii.1934, no. 82.

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### XIII—ON THE FLORA OF THE NEARER EAST: XVII.\*

NEW PLANTS AND NEW RECORDS. W. B. TURRILL.

***Arenaria Teddii* Turrill**, sp. nov.; ab *A. murale* Sieb. foliis superioribus latissime ovatis, bracteis foliaceis conspicue differt.

*Herba* ramosissima, caulibus teretibus tenuibus densissime glanduloso-hispidulis. *Folia* elliptica (suprema excepta), apice acuta, basi angustata, sessilia, vel breviter petiolata, usque ad 9 mm. longa et 4 mm. lata, costa nervis lateralibusque supra obscuris infra leviter prominentibus, pagina utraque glanduloso-hispidula, suprema late ovata vel fere orbicularia et gradatim minora, sessilia. *Inflorescentia* pauciflora, ramosa, ramis tenuibus, glanduloso-hispidulis, internodiis usque ad 3 cm. longis, pedicellis 2 cm. longis vel saepissime brevioribus ; bractae late ovatae, omnes foliaceae. *Sepala* acutissima vel breviter acuminata, 2.5 mm. longa, exteriora lanceolato-ovata 1.5 mm. lata, interiora lanceolato-oblonga 1 mm. lata, viridia, membranaceo-marginata (interiora praecipue), dorso hispidulo-glandulosa, leviter carinata, nervis lateralibus utrinque 2 inconspicuis. *Petala* alba, elongato-obovata, 4 mm. longa, 2 mm. lata, apice plus minusve rotundata, integra (vel interdum fortasse leviter emarginata vel brevissime denticulata), tenuissime trinervia. *Filamenta* usque ad 4 mm. longa, glabra ; antherae dehiscentes 0.6 mm. longae. *Ovarium* obloideum, tri- (rarissime bi-) sulcatum, 0.5–0.75 m. altum, 1–1.25 mm. diametro ; styli 3 (rarissime 2), omnino liberi, usque ad 1.75 mm. longi. *Capsulae* valvae 3 mm. longae, apice acutae obtusae vel leviter truncatae, patentes vix recurvae. *Semina* ambitu fere hemisphaerica, 1 mm. longa, nigra, semituberculata dorso praecipue.

S. MACEDONIA : Mt. Pangaion (south side), 5.10.1933, rock crevices, dry place overhung by lofty rock, 680 m., *Tedd* 1249.

An account of *Arenaria oxypetala* S. et S. and allied species (included *A. muralis* Sieb.) was published in the Kew Bulletin,

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\* Continued from K.B., 1935, 35.

1932, 450. It was there shown that in the countries around the Aegean Sea there occur a number of microspecies occupying more or less distinct geographical areas. The plant described above as *A. Teddii* is yet another of this plexus, but from an area farther to the north than *A. oxypetala* and the other species already considered. One other species needs mention in connection with *A. Teddii*, namely *A. graeca* (Boiss.) Hal. Consp. Flor. Graec. 1, 232 (1900). This is known from various mountains in Greece, "in rupibus regionis abietinae et superioris." It is distinguished morphologically from *A. Teddii* very readily by its larger flowers.

Nadji (Charrel) in Empire Ottoman Géogr. Bot. 13 (1892) lists "*Arenaria graveolens* Schreb. varietas Pangea Mihi. Pernardaghe 1500 m." In Oesterr. Bot. Zeitschr. 42, 272 (1892) what is probably the same plant is given as "*Arenaria nervosa* Halácsy et Charrel, species vel varietas *A. graveolentis* Schreber, foliis subtus bene trinerviis. Pournar daghe. Studio digna." Hayek, Prodr. Flor. Penins. Balc. 1, 194 (1924) reduces *A. nervosa* Hal. et Charr. to *A. filicaulis* Fzl. in Griseb. Spic. 1, 203 (1843). This latter, described from material collected "in regione montana m. Athús," is however distinct from *A. Teddii* in a number of characters including the shape of the leaves, especially the upper leaves and lower bracts and the size of the flowers (type and other material at Kew). It is obviously impossible to identify *A. nervosa* from the meagre published data, but if Hayek be right in his reduction then *A. Teddii* is a very distinct plant from that collected by Nadji Effendi.

**Holosteum umbellatum** L. var. **tenerrimum** (Boiss.) Gay in Anns. Sci. Nat. 3ème Sér. 4, 35 (1845). *H. tenerrimum* Boiss. Diagn. 1, i. 53 (1842).

W. THRACE : Macasclar, 20.4.1930, 250 m., grassy places among dry rocks, brushwood, etc., *Tedd.* 212. The plant secretes a sticky substance. Karpouz Tepé, 25.5.1933, 610 m., rocky slopes and among bushes, *Tedd.* 1074. Flowers white.

This variety (or species) is known from various localities in western Asia Minor. Its chief characteristic is the large size of the petals which are up to 15 or 16 mm. long and project 8 or 9 mm. beyond the sepals. So far as is known it has not previously been recorded in print from Europe. It seems probable that *Holosteum praeumbellatum* Candargy in Bull. Soc. Bot. Fr. 44, 156 (1897), published with a most inadequate description of one and a half lines only, from Lesbos, is this plant. *H. macropetalum* Hausskn. et Bornm., Mitt. Bot. Ver. Jena 9, 15 (1891) is also either the same or very closely related.

The Thracian material has rather larger petals than are to be found in Boissier's material at Kew. Also *Tedd.* (for No. 1074) records the flowers (petals) as white, while Boissier says the petals are "pallide roseis," a statement which is repeated by Gay. No other information is available as to petal colour in the variety.

The petals are distinctly, though not densely, ciliated at the base. There are ten stamens in a flower, all bearing well-developed fully polliniferous anthers.

***Silene dichotoma* Ehrh. var. *glabra* Turrill, var nov., a planta typica omnibus partibus glabris differt.**

*Planta* annua, caulibus erectis floriferis 5 praedita, omnino glabra. *Caulis* erecti, teretes, usque ad 4.5 dm. alti, purpurei (inferne praecipue). *Folia caulina* lineari-elliptica vel superiora fere linearia, acuta, inferne angustata, usque ad 4 cm. longa et 5 mm. lata sed saepissime 1-3 mm. latis, vaginis 0.5-2 mm. longis vel (in foliis superioribus) nullis. *Inflorescentia* paullum ramosa; bractae ovatae, membranaceae vel late membranaceo-marginatae. *Calyx* 11 mm. longus, dentibus triangularibus 2 mm. longis inclusis, glaberrimus. *Petala* 1.5 cm. longa, biloba, lobis 4.5 mm. longis, 2.5 mm. latis, coronis squamis 0.5 mm. longis. *Antherae* 2.5 mm. longae.

W. THRACE: Porto Lagos, 23.5.1930, sandy places near the coast, *Tedd* 336.

*Silene dichotoma* was described by Ehrhart in his Beitr. 7, 143 (1792). The country of origin is given as Hungary with a question mark. In 1824 *S. racemosa* Otth. was described in DC Prodr. 1, 384, based on *S. divaricata* S. et S. Fl. Graec. Prodr. 1, 293 (1806) and Fl. Graec. t. 414 (1825) with the type collected "in agro Carisiensi." *S. Sibthorpiana* Reichb. Flor. Germ. Excurs. 815 (1832) was based on *S. dichotoma* of the Fl. Graec. t. 413 (1825), in which the distribution was given as "in insulâ Cretâ, et circa montem Olympum Bithynum; etiam, ni fallor, prope Thessalonicam." With the knowledge now obtained, in part from breeding work in other species of the genus, there can be little doubt that *S. dichotoma*, *S. racemosa*, and *S. Sibthorpiana* represent variations within one species. The degree of dichotomous branching (the supposedly chief difference between *S. dichotoma* and *S. racemosa*) appears to depend largely on environmental conditions. The presence or absence, or more accurately the degree of development, of the corona, has possibly some taxonomic importance. Even this character however, we know is not "constant" in other species of the genus.

Accepting then *Silene dichotoma* Ehrh. in a broad sense we have to reckon with a highly polymorphic species and it is doubtful how far the variations represent either real intraspecific entities or combinations of interchangeable and interchanging genes. Only much fuller field observations and experimental work can give a stable basis of fact for permanent classification. Tentatively *Tedd's* No. 336 is considered a variety characterized by being glabrous in all its vegetative and floral parts. There are no similar specimens among the fairly rich material of the species at Kew nor has any record been traced in literature. It is interesting to note that *Silene graeca* Boiss. et Sprun., a species usually regarded as

closely allied, is altogether glabrous. This species has, however, good differential characters, *inter alia*, in the leaf shape and the calyx teeth.

Other material at Kew of *S. dichotoma* from W. Thrace includes : Xanthie (Soune Mahalla), 60 m., dry stony or sandy soil of neglected terraces, 20.5.30, *Tedd.* 310. Hairy in all parts, with especially long, crisped, and almost bristly hairs on the calyx nerves.

Porto Lagos, sandy places near coast, 23.5.30, *Tedd.* 335. Hairy in all parts.

Near Phanar, sandy places near shore, forming an association with *Scirpus Holoschoenus*, 18.6.33, *Tedd.* 1078. Hairy in all parts.

Xanthie, 210 m., among rocks and bushes of lower slopes of hills, 10.5.34, *Tedd.* 1381. Plant hairy all over and especially with long hairs on the the calyx. The inflorescence is several times branched and the plant is, in this respect, to be placed as "*var. racemosa.*"

***Euphorbia cernua* Coss et Dur. ex Boiss. in DC. Prodr. 15, 2, 138 (1862).**

S. MACEDONIA : Krystallopegae (Smerdesh), 21.6.32, c. 1080 m. shady places round bushes on dry slopes on south side of valley towards Breznitsa, *Alston and Sandwith* 954.

This species was originally described from material collected by Cosson "in Algeriae montibus Jurjura prope Dra el Mirzan." It has since been recorded from various localities in Algeria. It is further interesting to note that more recently it has been found in Italy (see Trotter in *Nuov. Giorn. Bot. Ital. N.S.* 34, 1065 : 1928, and the earlier references given there). Probably the inconspicuous common weed-like appearance, which closely resembles that of several other species, notably *E. Peplus*, has led to its not being collected. It may have a wider and more continuous distribution than is at present known.

The Macedonian specimens agree well with authenticated, probably type, material from Algeria except that the seeds are, on the average, slightly smaller. This may be due to the plants being collected before the seeds were fully ripe.

The above identification was first made by Mr. N. Y. Sandwith.

#### XIV—ON THE SYSTEMATIC POSITION OF THE GENUS *DOLIANTHUS* C. H. WRIGHT.

C. E. B. BREMEKAMP.

Dr. C. van Steenis of the Buitenzorg Herbarium drew my attention to the monotypic genus *Dolianthus* C. H. Wright, of which he had seen the type specimen in the collection at Kew. The plant had struck him because it looked more like a member of the *Rubiaceae* than of the *Loganiaceae*, the family to which it had been referred by its author. When, by the courtesy of the

Director, I had an opportunity to study the material, I soon came to the conclusion that Dr. van Steenis was right. It is very probable that, originally, Wright also regarded the plant as belonging to the *Rubiaceae*, for his description of the genus (Kew Bull. 1899, 106) begins with the remark "*Hymenocnemidi* Hook. f. *proximus*"; and this genus *Hymenocnemis* has always been considered to belong to the *Rubiaceae*. It was probably the position of the ovary, which he described as superior, that induced him to refer the plant to the *Loganiaceae*. From the other genera of this family, however, it differs conspicuously in the shape and size of its rather large, interpetiolar stipules and in its uni-ovular ovary cells. These points alone are of sufficient importance to justify doubting the correctness of Wright's classification. There is, moreover, some reason to distrust his statement that the ovary is superior, as in the genera which, in my opinion, are its nearest allies the disc is as a rule very large, sometimes even larger than the ovary itself (compare, for instance, the figure in Hooker's "Icones Plantarum," t. 2810, of *Neo-Schimperia heterophylla* Hemsl., which its author afterwards reduced to *Amaracarpus pubescens* Bl.). It is not improbable, therefore, that what Wright regarded as the ovary was in reality mostly disc. As the type specimen possesses but a single intact flower, which of course could not be sacrificed, and as from the flower dissected by Wright the ovary has not been preserved, I was unable to get to the bottom of this question. The shape of the calyx and the insertion of the corolla, however, make it very probable that my interpretation is correct, and that the plant, therefore, belongs to the *Rubiaceae*.

The question which we shall have to solve next is the position which is to be assigned to the genus in the *Rubiaceae*, but before entering into a discussion of this point we shall have to examine in some detail the description given by Wright. It reads as follows:

"*Dolianthus* C. H. Wright (gen. nov.): *Hymenocnemidi* Hook.f. *proximus*. Flores axillares, solitarii. Calyx aequaliter 4-lobatus, sine dentibus intermediis. Corollae tubus infundibuliformis; lobi 4 valvati. Stamina 4 ad corollae faucem subsessilia. Ovarium superius, 2-loculare; stylus filiformis, stigma incrassatum, minute 2-lobatum; ovula solitaria, erecta. Arbuscula habitu Coprosmae, foliis coriaceis."

The description of the flowers as axillary is obviously a mistake: they are terminal, and the rather characteristic pseudo-dichotomous type of branching owes its origin to this peculiarity. The flower which Wright dissected and of which calyx and corolla are still preserved was 4-merous; the flower which he left intact, however, is 5-merous. The stamens are inserted somewhat above the middle of the tube, not in the throat, and their filaments are slightly longer than the anthers. The latter are dorsifixed and obtusely bilobate

at the base, not sagittate, as Wright describes them in his diagnosis of the species.

The following description corrects these inaccuracies and gives moreover information with regard to a few points to which Wright paid no attention.

**Dolianthus** C. H. Wright, gen. nov. *Rubiacearum Psychotriearum*, generi *Amaracarpus* Bl. valde affinis.

Arbuscula ramosior, ramis dichasialiter dispositis, novellis pilis rufis fortioribus sparse vestitis, foliis coriaceis, parvis, decussatis et quadrifariam patentibus, stipulis interpetiolaribus, simplicibus, deciduis. Flores ramos ordinares terminantes, solitarii, pedicellati, ebracteolati, 4-5-meri. Ovarium probabiliter inferius, 2-loculare, ovulis solitariis, erectis. Calyx lobatus; lobi triangulares. Corollae tubus infundibuliformis; lobi oblongi, crassiusculi, intus papilloso, tubo breviores. Stamina paulo supra medium tubi inserta, filamentis brevibus, antheris subinclusis, dorsifixis, basi obtuse bilobatis, introrsis, longitudinaliter dehiscentibus. Discus probabiliter crassus; stylus filiformis, paulo supra faucem exsertus; stigma incrassatum, minute bilobatum. Fructus ignotus.

Species unica: *D. vaccinioides* C. H. Wright; Nova Guinea, Mt. Scratchley, alt. 1000-1300 ft.

The uni-ovular ovary cells, the erect ovules, the valvate aestivation of the corolla lobes, the insertion of the stamens in the upper half of the corolla tube and the short stigma lobes all point in the direction of the *Psychotrieae*. In this tribe there are a few genera in which the flowers are either solitary or arranged in few-flowered inflorescences, and in which the ovary at the same time is two-celled, and it is in this group that we shall have to find a place for the genus *Polianthus*. It comprises: *Hymenocnemis* Hook.f. (the genus to which reference was made already by Wright in his diagnosis), *Saprosma* Bl., *Saldinia* A. Rich., *Margaritopsis* Sauv. and *Amaracarpus* Bl. The inflorescences in these genera are, as a rule, axillary. In *Amaracarpus*, however, they are terminal. This genus resembles *Dolianthus* moreover in the smallness of its leaves and in the presence of the same kind of rather thick, rufous hairs on the young shoots. Its flowers, on the other hand, are much smaller, and there is moreover a considerable difference in habit. In *Amaracarpus*, in the same way as in some species of *Phyllanthus*, the main branches resemble bipinnate leaves, the branchlets and the leaves being arranged in the same more or less horizontal plane; in *Dolianthus* however, as we have seen already, the ramification is a kind of pseudo-dichotomy, and the branchlets and leaves point in all directions.

## XV—TWO NEW ARUNDINARIAS FROM YUNNAN.

Y. L. KENG.

**Arundinaria Forrestii** Keng, sp. nov.; verosimiliter affinis *A. melanostachyi* Hand.-Mazz., a qua ramulis floriferis e quoque nodo fasciculatis, racemis 3-4-spiculatis, spiculis minoribus differt.

*Culmi* 1.2-2.4 m. alti (teste *Forrest*), internodiis primariis 7-9 cm. longis et 3-4 mm. crassis, ceteris ignotis; ramuli foliiferi ignoti, floriferi dense fasciculati. *Vaginae* infra racemum plerumque 3-5, 2-3 cm. longae, imbricatae, striatae, glabrae vel margine ciliolatae. *Racemi* saepissime 3-4-spiculatae, basi inclusi vel breviter exserti, pedicellis tenuibus laevibus 3-9 mm. vel terminalibus usque 15 mm. longis. *Spiculae* 5-9-florae, 3-4.8 cm. longae, maturitate purpurascentes, rhachillae articulis 5-6 mm. longis tenuibus dorso puberulis margine et apice distincte ciliatis. *Glumae* 2, acuminatae, glabrae, prima 4-7 mm., secunda 8-13 mm. longa. *Lemmata* acuminata vel cuspidata, omnino puberula, primo 15-17 mm. longo 7-nervi. *Palea* 12-13 mm. longa, bidentulata, carinis superne ciliatis. *Antherae* 7-8 mm. longae. *Stigmata* 2-3, circiter 3 mm. longa.

YUNNAN: bamboo brakes on the Mekong-Salwin divide, lat. 28° 12' N., 3000 m., July 1917, *Forrest* 14127 (Herb. Kew.).

This species is probably related to *A. melanostachys* Hand.-Mazz., from which it differs, however, in having floriferous branches fasciculate at each node, 3-4-spiculate racemes, and smaller spikelets.

**Arundinaria acutissima** Keng, sp. nov.; *A. Forrestii* Keng supra descriptae affinis, habitu graciliore, ramulis floriferis multinodibus, glumis longioribus cuspidatis, antheris brevioribus distincta.

*Culmi* 0.6-2.4 m. alti (teste *Forrest*), internodiis primariis 4-8 cm. longis et 1.5-2 mm. crassis, ceteris ignotis; ramuli foliiferi pauci, cum ramulis floriferis intermixti, 2.5-4 cm. longi, vaginis 4-5 imbricatis inclusi; vaginae apice laminam usque 3.5 cm. longam et 4.5 mm. latam gerentes; ramuli floriferi fasciculati, primarii ramulosi, ramulo ultimo tenuissimo multinodi plerumque inferne nudo cum internodiis 1.5-2 mm. longis, vaginis compluribus 1.5-2 cm. longis imbricatis superne incluso. *Racemi* inferne inclusi, plerumque 3-4-spiculati, pedicellis tenuibus laevibus 6-20 mm. longis. *Spiculae* 4-6-florae, 2.5-3.5 cm. longae, maturitate purpurascentes, rhachillae articulis tenuibus 5-6 mm. longis albo-puberulis apicem versus ciliolatis. *Glumae* 2, cuspidatae, glabrae (apicem versus interdum scaberulae), 3-5-nerves, prima 8-11 mm., secunda 11-14 mm. longa. *Lemmata* cuspidata, 7-nervia, laevia vel secundum nervos saepe ciliolato-scaberula (inter nervos item saepe adpresso-puberula), primo 15-17 mm. longo, callo pilis albis circiter 0.8 mm. longis pubescente. *Palea* tenuis, circiter 1 cm. longa, bidentata, secundum carinas superne rigide ciliata, dorso glabra, carinis circiter 1 mm. remotis. *Antherae* circiter 5 mm. longae. *Stigmata* 3, circiter 2 mm. longa (immatura).

YUNNAN : N'Maikha-Salwin divide, lat. 26° 20' N., 3000 m., in thickets, June, 1919, *Forrest* 18074 (typus, Herb. Kew.); cane thickets on the slopes of the Lei-lung Shan, lat. 28° 10' N., 4200 m., July, 1917, *Forrest* 15211 (Herb. Kew.).

Allied to the preceding *A. Forrestii*, but differs in its slenderer habit, multinoded flowering branches, longer cuspidate glumes, and shorter anthers.

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## XVI—MISCELLANEOUS NOTES.

**Eightieth Birthdays.** We offer our sincere congratulations to the following botanists who have attained the age of eighty during 1935 :—Professor J. M. Macfarlane (Sept. 27th), Professor F. O. Bower (November 4th), Mr. H. N. Ridley (Dec. 10th), and Professor C. Schröter (Dec. 19th).

DR. J. HUTCHINSON.—Dr. Hutchinson has been elected an Honorary Fellow of the American Amaryllis Society.

ALBERT SPEAR HITCHCOCK.—The unexpected death of Dr. A. S. Hitchcock on Dec. 16th, 1935, will be deeply regretted by his many friends in this country. Owing to a heart attack he passed away on board the liner in which he was returning to the United States after spending several months in Europe visiting various herbaria and attending the International Botanical Congress at Amsterdam. For many years Hitchcock had been a regular correspondent of Kew, and only the day before sailing, found time to visit the Herbarium in order to complete his studies there.

Albert Spear Hitchcock was born at Owosso, Michigan and celebrated his 70th birthday on Sept. 4th last, whilst at Amsterdam. He was educated at the Iowa State College, where he took his B.S.A. degree in 1884, followed by his M.S. and Sc.D. degrees in 1886 and 1920 respectively. An honorary D.Sc. degree was conferred on him by the Kansas State College in 1934.

Hitchcock was mainly occupied with teaching in the first stage of his career from 1885 to 1901, his most important position in this capacity being the Professorship of Botany at the Kansas State College (1892–1901). It was during this period that he published a number of papers on the plants and flora of Iowa, Kansas and Florida, on ecology, economic plants, etc. In addition, whilst serving as Botanical Assistant at the Missouri Botanic Garden (1889–91), he went on an expedition to the West Indies and an account of the plants collected in the Bahamas, Jamaica and Grand Cayman appeared in 1893. From 1901 onwards most of his time was devoted to the study of the Gramineae, first as Assistant Agrostologist and later (1905) as Systematic Agrostologist to the United States Department of Agriculture. At that time he was appointed also Custodian of the Section of Grasses at the United



States National Museum. Since 1928, he had been Principal Botanist in charge of Systematic Agrostology in the U.S. Department of Agriculture.

In order to study grasses in their natural habitats and to make collections for the Washington Grass Herbarium, he made extensive expeditions to many parts of the world. At one time or another he had visited all the American States and in fact most countries in America from Alaska to Chile on the west and Labrador to British Guiana on the east. In 1916, he collected in the Hawaiian Islands and in 1921 in Japan, China, Indo-China and the Philippine Islands. At various times he had travelled in Europe for the purpose of studying the type-specimens of American grasses preserved in continental and British Herbaria, or to attend botanical conferences. In 1929, Hitchcock was invited to attend the combined meetings of the British and South African Associations for the Advancement of Science at Cape Town and Johannesburg. The return journey to the United States was made via Southern Rhodesia and East Africa. He spent some days at the Agricultural Research Institute at Amani in Tanganyika Territory and later a week at Moshi whence he ascended Kilimanjaro to 13,000 ft. He stayed several weeks in Kenya Colony and finally visited Uganda. At all these centres and wherever he stopped Hitchcock collected grasses, and even on a railway journey he was to be seen struggling into the carriage at the last moment heavily laden with bundles of specimens snatched during a brief halt.

It would take far more space than can be allotted here to do full justice to Dr. Hitchcock's numerous and invaluable contributions to our knowledge of the Gramineae. They commence nearly forty years ago with an account of the grasses of Kansas (1896-98). After his appointment as Agrostologist at Washington, there appeared a continuous series of publications from his pen, comprising grass-floras of Cuba, Mexico, West Indies (with Mrs. Chase), British Guiana, Peru, Bolivia and Ecuador, and Central America; monographs of the American species of *Agrostis*, *Leptochloa*, *Panicum* (with Mrs. Chase), *Echinochloa*, *Aristida*, etc.; the "Genera of Grasses of the United States"; a "Manual of Farm Grasses"; besides numerous papers on type-specimens, nomenclatural problems and new species. His last great work dealt appropriately with the grasses of his own country. This was the "Manual of Grasses of the United States," published in 1935 and containing descriptions of over 1100 species, nearly all being illustrated. He was the author of two other important works, namely, his "Text-Book of Grasses" and "Methods of Descriptive Systematic Botany."

No biographical notice of Hitchcock would be complete without special reference to his work on plant nomenclature. Unlike some nomenclaturists he always kept an open mind and was guided very largely by practical considerations.

The division of opinion at the Vienna Congress left an unfortunate legacy of ill-feeling between some of the keenest supporters

of the International Rules and of the American Code. In the Regulations for Fixing Generic Types (Science, n.s. 46. 333-336 : 1919) in the preparation of which he took so prominent a part, the type method was developed in a manner more suitable for general acceptance. Mechanical provisions for fixing types, such as the acceptance of the first species mentioned by the author as the generic type, though not entirely eliminated were much less stressed, greater importance being attached to the original description and other elements showing what species the author had chiefly in mind.

Hitchcock's ideas were further developed in the Type-Basis Code of Botanical Nomenclature, (Science, n.s. 53. 312-314 : 1921) the publication of which did much towards popularizing the type-method. By his writings and his support at the Fourth International Botanical Congress, Ithaca, 1926, of a project for nomenclatural re-union, Hitchcock contributed largely to the international agreement on the subject so happily attained at Cambridge in 1930. In this work of conciliation his modesty and kindly disposition played a great part.

The practical nature of much of Hitchcock's work on nomenclature is seen in a paper on the "Standard-species of Linnean genera of Phanerogamae" (Prop. Brit. Bot. 111-195 : 1929) of which he was part author. Almost his last work was the completion of his report and votes on generic names proposed for conservation at Amsterdam.

Hitchcock was undoubtedly one of the world's most distinguished agrostologists, and his name will be linked with those of Trinius, Nees, Bentham, Hackel and Stapf, as one who has greatly advanced and clarified our knowledge of the grasses.

NEVILLE LOUIS COOPER.—We regret to record the death of Mr. N. L. Cooper which took place suddenly at his residence, Wellington Crescent, Ramsgate, on January 9th. Mr. Cooper was 71 years of age and had for many years been a correspondent of Kew in connexion with his interest in conifers and in rock plants. His father, Thomas Sidney Cooper, C.V.O., R.A., of Canterbury, was famous as a painter of animals, and the son inherited his love for art, an interest that he was able to turn to practical account when it became necessary for him to adopt a business career. For many years he was in business as a picture dealer until ill-health compelled him to retire. During retirement his time was fully occupied with his pinetum at Little Hall, St. Stephens, Canterbury, and his rock garden and supplementary collection of conifers at Vernon Holme, Harbledown. Conifers at both places were very well grown, and Mr. Cooper was awarded a Silver Banksian Medal by the Royal Horticultural Society for a collection of specimens contributed to the Conifer Conference in 1930.

His pinetum contains many rare species which he tended as children and was very grieved when one died. In view of this his forgiving spirit, as shown in the following anecdote, is all the more

remarkable. Amongst his trees at Little Hall was a very vigorous young specimen, five or six feet high, of *Picea Breweriana*, which three or four years ago was hacked off and carried away by a thief for use as a Christmas tree. The culprit was traced, but was let off after a mild chiding. In relating the incident to the writer, Mr. Cooper concluded, "After all, how was the poor man to know that he was cutting down my rarest tree?" His rock garden at Vernon Holme took up much of his time during the last few years. It covers an extensive area and contains many choice plants, although the owner was more interested in the production of broad effects by special subjects than in the cultivation of a great number of species.

W. DALLIMORE.

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**Works on Diatomaceae available on loan, II.\***—Some time ago Mr. Adams sent to Kew a second collection of his duplicate books on diatoms, to be added to others received at an earlier date by the Bentham-Moxon Trustees for study by workers on this group of plants. The books may be consulted at Kew or borrowed by responsible persons on payment of carriage both ways.

**Boyer, C. S.** The Biddulphoid forms of North American Diatomaceae (Proc. Acad. Nat. Sci. Philadelphia, 1900). [Philadelphia], 1900. 8vo. 64 pp.

**Boyer, C. S.** The Diatomaceae of Philadelphia and vicinity. Philadelphia, 1916. 4to. 143 pp. 40 pls.

**Boyer, C. S.** Synopsis of North American Diatomaceae (Proc. Acad. Nat. Sci. Philadelphia, 78, Suppl.—79, Suppl.). Philadelphia, 1927. 8vo. 583 pp.

**Brun, Jacq.** Diatomées : espèces nouvelles marines, fossiles ou pélagiques (Mém. Soc. de Phys. et d'Hist. Nat. Genève, 31). Genève, 1891. 4to. 48 pp. 12 pl. (2nd copy).

**Brun, J., & Tempère, J.** Diatomées fossiles du Japon. Espèces marines et nouvelles des calcaires argileux de Sendai et de Yedo (Mém. Soc. de Phys. et d'Hist. Nat. Genève, 30). Genève, 1889. 4to. 75 pp. 8 pl. (4th copy).

**Castracane, F.** Report on the *Diatomaceae* collected by H.M.S. Challenger during the years 1873–1876. London, 1886. 4to. (3rd copy).

**Cleve, P. T.** Synopsis of the Naviculoid Diatoms. Pts. 1 & 2 (K. Svenska Vet.-Akad. Handl. 26, no. 2, & 27, no. 3).

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\*See K.B. 1932, 250.

Stockholm, 1894-95. 4to. Pt. 1, 194 pp. 5 pl. & Pt. 2, 219 pp. 4 pl. (2nd copy).

**Diatomeëntafeln** zusammengestellt [von Weissflog] für einige Freunde. 81 plates. New York [s.a.]. 8vo. (2nd copy).

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**Donkin, A. S.** The natural history of British Diatomaceae. Parts 1-3. London [s.a.]. 8vo.

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**Hustedt, F.** Die Kieselalgen Deutschlands, Österreichs und der Schweiz, etc. I. Teil (Rabenhorst's Krypt.-Fl. Bd. 7). Leipzig, 1930. 8vo. 920 pp.

**Janisch, C.** Diatomeen (Die Forschungsreise S.M.S. "Gazelle" . . . 1874 bis 1876, etc.) 22 pls.

**Lens, The.** A quarterly journal of microscopy . . . with the Transactions of the State Microscopical Society of Illinois. Edited by S. A. Briggs. Vols. 1 & 2. Chicago, 1872-73. 8vo.

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**Ratray, J.** A revision of the genus *Aulacodiscus* Ehrb. (Journ. R. Micr. Soc. 1888). London, 1888. 8vo. 46 pp. 3 pl. (3rd copy).

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37. **Lauder, Henry Scott.** On new Diatoms (Trans. Microsc. Soc. 12). London, 1864. 8vo. 3 pp.
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2. **Burgess, E. W.** Notes on the structure of the *Diatomaceae* (Micr. News & Northern Microscopist.). London & Manchester, 1883. 5 pp.
3. **Cole, A. C.** The preparation of *Diatomaceae* (Methods Micr. Res., part 10). London, 1884. 8vo. 5 pp.
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2. **Gill, C. H.** On some methods of preparing diatoms so as to exhibit clearly the nature of their markings (Journ. R. Micr. Soc. Part 2. 1890). [London & Edinburgh], 1890. 4 pp.

3. **Gran, H. H.** Bemerkungen über einige Planktondiatomeen (Nyt Mag. Naturv. 38). Christiania, 1900. 8vo. 26 pp. 1 pl.
4. **Kain, C. H. & Schultze, E. A.** On a fossil marine diatomaceous deposit from Atlantic City, N.J. (Bull. Torr. Bot. Club, 16). [New York], 1889. 8vo. 6 pp. 1 pl.
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3. **Mann, A.** Report on the diatoms of the Albatross voyages in the Pacific Ocean, 1888–1904 (Contrib. U.S. Nat. Herb. 10). Washington, 1907. 8vo. 199 pp. 11 pls.

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  2. **Conger, P. S.** Diatoms (in the Flora of Penikese, fifty years after, ed. by I. F. Lewis) (Rhodora, 26). [Lancaster, Pa.], 1924. 8vo. 9 pp.
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**Amsterdam Resolutions.**—The following resolutions which were passed at the Sixth International Botanical Congress at Amsterdam, 1935, are published at the request of the Executive Committee.

1. GENERAL RESOLUTION.

It is proposed that the Botanical Section of the International Union of Biological Sciences should act as an administrative connecting link between successive International Botanical Congresses, which maintain their full independence from an international point of view to such an extent that any country which has not joined the Union, will have quite the same rights as those which have joined.

It is proposed that this Botanical Section be authorized to carry through any resolutions, carried by the International Botanical Congresses.

Proposed by A. C. SEWARD and seconded by J. C. SCHOUTE, E. J. BUTLER, E. D. MERRILL, N. NĚMEC, M. J. SIRKS and N. E. SVEDELIUS.

2. GENERAL RESOLUTION.

By reason of the growing financial difficulties and the prohibitive price, for certain museums and laboratories, of transmission by post, rail and boat, it becomes impossible to guarantee the indispensable exchange of collections of dried plants. It is therefore necessary to obtain for this exchange the free transport now accorded to the exchange of scientific publications.

The Congress asks the Office of the International Union of Biological Sciences to take the necessary steps with various governments in order to obtain this postal privilege.

Proposed by B. P. G. HOCHREUTINER and seconded by H. HUMBERT, E. D. MERRILL, A. A. PULLE and C. SKOTTSBERG in the name of the meeting of Directors of Botanical Gardens.

### 3. SECTION AGR.

That the Seventh International Botanical Congress shall arrange a Section for Agronomy on the same lines as that of the Sixth Congress.

Proposed by the Section for Agronomy.

### 4. SECTIONS CYT. AND GEN.

That the Botanical Section of the International Union of Biological Sciences on behalf of the Sixth International Botanical Congress should apply to the International Committee for Genetical Congresses for the appointment of an International Committee to study the different meanings of various cytological and genetical terms used in the literature, to propose exact definitions of these terms and to suggest if and what further steps are necessary to improve the terminology of genetics and cytology.

Proposed by F. W. SANSOME and seconded by M. J. SIRKS.

### 5. SECTIONS CYT. AND GEN.

The Sections of Genetics and Cytology of the Sixth International Botanical Congress take the occasion of their presence in Holland to record the deep sense of debt which the sciences of Genetics and Cytology owe to Hugo de Vries. It is a satisfaction that he lived to such a ripe old age and thus saw the imposing structure which has been erected on the foundations in the laying of which his painstaking investigations and prophetic vision had so large a share.

The Honorary Secretary of the Congress is hereby requested to record this resolution in the minutes of the Proceedings and to send a copy to Mrs. de Vries with the sympathy of the Congress and with the assurance that Hugo de Vries will remain for all time an inspiration to biologists and live as one of the immortal heroes of Science.

Proposed by A. F. BLAKESLEE and seconded by F. OEHLKERS and E. W. SINNOTT.

### 6. SECTION GEO.

The Sixth International Botanical Congress at Amsterdam, 1935, appeals to all botanists and cartographers with the request that they should employ for the same plant communities the same colouring and for sociologically related plant communities, especially in survey maps, similar tints, in accordance with the proposals which the Fifth International Botanical Congress put forward at Cambridge. Should the case arise, necessary modifications shall be made.

### 7. SECTION GEO.

The Sixth International Botanical Congress draws the special attention of Public Bodies, Scientific Institutes and Societies for the International Protection of Nature to the regrettable danger of inconsiderate destruction of primitive vegetation to which, in

the future vast territories, especially in tropical and subtropical countries, will be exposed through the nefarious practice of brushwood and prairie fires.

It points out the often radical changes brought about by this practice in the biologic complex constituted by the community of plants and animals. On the one hand, a very great number of species are threatened in a short time with total extinction ; many of them being of the greatest interest from the scientific, aesthetic and economic points of view. On the other hand, countries formerly covered with a woody vegetation of various types, are becoming, or are in process of becoming, deserts in consequence of the changes which the destruction of this vegetation produces upon the local climate, the hydrologic conditions and the physico-chemical characters of the soil.

The Congress emphasises the necessity :

- (1) Of constituting in these countries permanent and fairly extensive reserves for safeguarding the equilibrium of the natural conditions and the living members of the vegetable and animal kingdoms (National Parks) ;
- (2) Besides the territories thus constituted as permanent Reserves, to lessen in some measure the consequences of the deforestation and exploitation by maintaining an adequate proportion of forest areas, taking this in its widest sense ;
- (3) To prevent the substitution of natural formations of woody autochthones by those of exotic species (in accordance with the conclusions of the International Conference for the Protection of the Fauna and Flora of Africa, London, 1933).

Proposed by H. HUMBERT and P. G. van TIENHOVEN and seconded by R. BOUILLENNE, J. BURTT DAVY, A. CHEVALIER, L. EMBERGER A. W. HILL, J. JESWIET, P. LEDOUX, R. MAIRE, E. D. MERRILL, G. NEGRI, I. B. POLE EVANS, J. RAMSBOTTOM and A. WILCZEK.

## 8. SECTION GEO.

The Sixth International Botanical Congress is conscious of the great dangers that result from the destruction of tropical and subtropical vegetation, and also of the perturbation caused in such regions by the action of man.

The Congress recommends the study of these problems by the botanists of these countries and that they may inform their governments.

The Congress asks especially that this information shall be collected and that it shall be published with a view to the most efficient protection of the indigenous vegetation.

The Congress appoints a Committee for studying this subject and for submitting a report to the Seventh Congress. The following members of this Committee are nominated : I. B. POLE EVANS, president ; H. HUMBERT, E. D. MERRILL and J. NABELEK, vice, presidents ; R. BOUILLENNE, H. BROCKMANN JEROSCH, A. CHEVA-

LIER, L. EMBERGER, A. W. HILL, J. JESWIET, P. LEDOUX, R. MAIRE, G. NEGRI, L. R. PARODI and M. F. GALLEGU QUERO and as secretary J. TROCHAIN.

Proposed by I. B. POLE EVANS and seconded by H. HUMBERT.

#### 9. SECTION GEO.

That the programme of the Seventh International Botanical Congress shall contain the study and the delineation of the characters of the various types of steppes, their origin, their development and especially of the discriminative criteria for climatic associations and secondary associations which get confused under the names "steppe," "prairie," "savannah," and of the definitions of the corresponding phytogeographic regions.

Proposed by H. HUMBERT and seconded by L. EMBERGER, H. GAMS, R. MAIRE, R. BOUILLENNE, A. EIG, G. NEGRI, J. TROCHAIN, H. BOJKO, P. LEDOUX, A. CONARD, E. WILCZEK, E. SCHMID and J. PODPĚRA.

#### 10. SECTION GEO.

A committee shall be appointed to elaborate proposals for a classification of climates from a phytogeographical point of view and to submit them to the Seventh International Botanical Congress.

Proposed by L. EMBERGER and seconded by H. BROCKMANN JEROSCH, S. P. AGHARKAR, A. CHEVALIER, A. EIG, H. GAMS, H. HUMBERT, P. LEDOUX, T. LIPPMAN, R. MAIRE, G. NEGRI, R. PAMPANINI, I. B. POLE EVANS, J. TROCHAIN.

#### 11. SECTION GEO.

The Geobotanical Section of the Sixth International Botanical Congress recommends :

- (1) To use the term *Sociation* for vegetation units characterized mainly by dominance in the different layers, in the sense of Scandinavian plant sociologists ;
- (2) To use the term *Association* for vegetation units characterized mainly by characteristic and differential species in the sense of Zürich-Montpellier plant sociologists, or at least for units of the same order of sociological value ; *Subassociation* and *Facies* can, where necessary, be used for their subordinate units ;
- (3) To unite sociations and associations into alliances in the sense of Zürich-Montpellier plant sociologists, and the alliances into higher units.

Proposed by J. BRAUN BLANQUET, G. E. DU RIETZ and R. NORDHAGEN.

#### 12. SECTIONS MYC. AND PATH.

The Sixth International Botanical Congress wishes to express its sincere appreciation of the admirable work accomplished by the Centraalbureau voor Schimmelcultures at Baarn since its foundation in 1906 and views with grave concern the present financial difficulties of what is essentially an international institution.

Proposed to the Section MYC. by J. RAMSBOTTOM and seconded by E. J. BUTLER ; to the Section PATH. proposed by E. RHIEM and seconded by E. C. STAKMAN.

13. SECTION PATH.

The Committee on Description and Nomenclature of Plant Viruses appointed by the Fifth International Botanical Congress, 1930, wishes to report that it has made progress in developing a scheme for the nomenclature of plant viruses and suggests to this Congress that the Committee be empowered to continue its considerations and establish an acceptable system of virus nomenclature.

Proposed by H. M. QUANJER and seconded by JAMES JOHNSON, P. A. MURPHY, J. HENDERSON SMITH and G. SAMUEL.

14. SECTION PATH.

It is recommended that the term "physiologic race" be substituted for "physiologic form" as the former seems more appropriate. It is recommended further that the word "race" be used in general to designate biotypes or groups of biotypes that differ from each other in physiologic characters.

Proposed by E. C. STAKMAN and seconded by MISS M. NEWTON, MISS G. WILBRINK and TH. ROEMER.

15. SECTION PATH.

The Sixth International Botanical Congress expresses itself of the opinion :

That an effective and unceasing campaign against destructive plant diseases and insect pests, can be successfully prosecuted only by international action and mutual co-operation ;

That close and frequent international discussion of the problems of plant quarantines should take place to bring about improvement of the health conditions of plants and plant products offered for export.

That it unanimously recognises that such action will greatly facilitate international trade in the commodities concerned ; and

That, finally, this resolution be brought to the attention of the League of Nations, emphatically endorsing the League's proposal to give this matter urgent and careful consideration with a view to facilitating and expediting the purpose and aims of this resolution.

Proposed by H. T. GUSSOW and seconded by N. VAN POETEREN.

16. SECTION SYS.

The Sixth International Botanical Congress agrees to the following propositions by the International Standing Committee for Urgent Taxonomic Needs :

- (1) Compilation of a new Phytography. The book should not cover the whole content of De CANDOLLE's "Phytographie" ; it should consist of a new compilation of the collections represented in the larger herbaria of the world. The Institutes are asked to draw up a list of their collections.
- (2) Photographs of Type Specimens. The scheme to photo-

graph the types of all plants is important, and should be encouraged, but involves very great expense. As the means of most Institutes are restricted at the present time, this point should be postponed to the next Congress.

- (3) International Dictionary of Botanical Terminology. The Dictionary should be restricted to Phanerogams. The Cryptogams are to be worked out by specialists of the individual groups. The Latin word should be translated and explained in English, French and German. For use in countries of other languages the botanists of such countries should supply translations. All terms would be given in alphabetical sequence. At the end, the most important terms for single categories (e.g., leaf, root, Orchids) might be placed together once more.
- (4) It is highly desirable, that the Linnean type specimens at the Linnean Society and at the British Museum should be photographed.

Proposed for the International Standing Committee for Urgent Taxonomic Needs by L. DIELS and seconded by A. D. COTTON, R. E. FRIES, R. MAIRE, E. D. MERRILL and J. RAMSBOTTOM.

#### 17.—SECTION SYS. SUBSECTION NOMENCLATURE.

##### *Votes of Thanks.*

To the Editorial Committee of the International Rules of Botanical Nomenclature, ed. III (1935), namely, Professor HARMS (General Editor), Dr. RENDLE and Professor HOCHREUTINER, for the successful manner in which they carried out their difficult task.

To the Executive Committee of the Fifth International Botanical Congress, Cambridge 1930, for defraying the cost of publication of the "Synopsis of Proposals" and "Preliminary Opinions" concerning nomenclature.

##### *Resolution.*

That the Sixth International Botanical Congress accepts the decisions of the Section of Taxonomy and Nomenclature concerning the modification of the International Rules of Botanical Nomenclature, ed. III (1935) and sanctions the appointment of the Standing Committees proposed by this Section.

Proposed by E. D. MERRILL and seconded by L. DIELS.

**Economic Products of the Malay Peninsula.\***—This work, published on behalf of the Governments of the Straits Settlements and Federated Malay States, should be to those countries what Sir George Watt's classic "Dictionary of the Economic Products of India" has been to India. It is modelled on similar lines,

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\* "A Dictionary of the Economic Products of the Malay Peninsula", by I. H. Burkill. Crown Agents for the Colonies, London, 1935. Pp. 2402, 2 vols. Price 30s.



although naturally smaller, and is a veritable store-house of information on the diverse economic products—vegetable, animal and mineral—that are to be found throughout Malaya.

The author, who was previously Officiating Reporter on Economic Products to the Government of India and Superintendent of the Industrial Section of the India Museum at Calcutta, became Director of the Gardens at Singapore in 1912. The preparation of the Dictionary actually commenced at this period, as the author points out in the introduction, although the greater part of its compilation has been carried out at Kew after his retirement from the Colonial Service in 1925.

A glance through the pages of the two large volumes gives some idea of the vast amount of labour that has been necessary in their compilation and preparation. Vegetable products occupy approximately nine-tenths of the subject matter and Mr. Burkill has been alone responsible for almost all of what appears in regard to them. A team of workers shared the task of preparing "The Dictionary of the Economic Products of India," and therefore Mr. Burkill's achievement in having completed so arduous a task practically single-handed deserves the highest praise. The contributions by other writers are those of known authorities on Malayan economic products in the geological, forestry and fishery fields. These constitute a relatively small proportion of the work and appear in the text under the initials of their respective authors.

The arrangement throughout is alphabetical, and vegetable products appear wherever possible under the genera to which they belong, with sub-headings for different species. In some instances, notably with minerals and well-known animals, the subjects are classified according to their common names. As copious cross-references occur and a general index is incorporated, the work is easy of reference. Marginal notes, indicating at a glance the content of the adjoining text, are a feature that will be appreciated. References to literature are given pertinently and not as separate lists.

The main object of the work, as the author states, has been to bring together existing information on Malayan products, as this occurs scattered over a wide range of literature not readily accessible even in the larger libraries. This has been accomplished and at the same time a great deal of valuable additional information, hitherto unpublished, has undoubtedly been incorporated. This the author modestly omits to mention in his introduction. It is questionable, for instance, whether such useful and detailed information on rattans as that which is given (occupying sixteen pages) exists elsewhere. Such aspects as the meaning of the word "rotan," general characteristics, collection, drying, trade supplies, uses, cultivation requirements, trade and Malay names with botanical equivalents all receive close attention. This thoroughness of treatment is typical throughout the work. Many of the products dealt with, such as various tropical crops, fruits and vegetables,

are not peculiar to Malaya, but are widely distributed in cultivation in warm countries. The usefulness of the book will not therefore be limited to the particular region for which it is intended.

The information given regarding early introductions of economic plants to Malaysia from other regions and their subsequent spread and general adoption is especially valuable. Having made a special study of Malay and other local native plant names the author is often able to employ this knowledge to advantage in his deductions as to the probable time and place of origin of certain plants. Native names are given for most species, and as these also appear alphabetically in the index, the book may be regarded as "A Dictionary of Malay Plant Names" in addition to its other functions.

In a work of this magnitude a few minor omissions are perhaps inevitable. A few appear to have occurred in regard to the index. Neither of the words "rubber" and "oil palm" appears in the index or as a heading in the text. To find the information given in regard to them it is necessary to look under *Hevea* and *Elaeis* respectively. While such omissions are not of great consequence, they may be a source of difficulty to some readers.

The printing and binding of the book, the work of the Oxford University Press, leave nothing to be desired and the price at which it is sold is certainly most reasonable for a work of this magnitude.

F. N. HOWES.

**Flora of Southern Quebec.\***—Under the somewhat ambiguous title, "Flore Laurentienne," Dr. Marie-Victorin has given us what is virtually a flora of Southern Quebec. Actually the area of his flora covers only about one half of the St. Lawrence valley: the Gaspé peninsula, Anticosti island, and the whole northern shore of the St. Lawrence below the Saguenay river, are excluded on grounds of convenience, since these regions are relatively sparsely populated and difficult of access, and their flora is still very imperfectly known. The southern boundary of the area coincides with the limits of the Province of Quebec, while the northern boundary at first follows the Hudson Bay-St. Lawrence watershed eastward, and then passes just north of Lake Saint-Jean and the Saguenay river, the boundary on the southern shore of the St. Lawrence being formed by the Matapédia river.

The total vascular flora of the area amounts to 1568 species—64 Pteridophytes, 13 Gymnosperms, 987 Dicotyledons and 504 Monocotyledons—compared with 1917 species recorded for the whole Province of Quebec. The arrangement of families follows

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\* "Flore Laurentienne," by Frère Marie-Victorin, D.Sc., Director of the Botanical Institute of Montreal. De La Salle Press, 949, Côté Street, Montreal, Quebec, Canada, 1935. Pp. 917, with 22 maps and 2,800 text-figs. by Frère Alexandre, L.Sc., Price, in cloth binding, 5 dollars.

the classification adopted by Wettstein in the third edition of his "Handbuch der systematischen Botanik" (1924). The keys to the genera and species draw largely on details of habit and habitat to the exclusion of technical characters which might offer difficulties to the tyro—in fact the work appears to be intended, not for professional botanists, but mainly, if not exclusively, as a practical handbook for the use of amateurs, and in particular for the "Cercles des Jeunes Naturalistes," to whose youthful members it is dedicated (p. 11). This purpose it seems admirably calculated to fulfil, the keys and short descriptions of the species being supplemented by clear and characteristic habit figures with occasional structural details. As a work of reference, on the other hand, it leaves much to be desired, the morphological information supplied being sometimes extremely meagre, as in the case of *Salix fragilis* and *S. alba*. The only "characters" by which these two species are distinguished in the key from the 14 native ones are that they are large trees planted round houses!

The history of botany in Quebec begins with the publication in 1635 of Jacques Cornuti's "Canadensium Plantarum Historia," in which *Actaea alba*, *Actaea rubra*, *Apios americana*, *Rhus Toxicodendron*, *Aquilegia canadensis*, *Asarum canadense* and other characteristic species were described and figured for the first time. Other descriptions of Quebec plants were included in Charlevoix, "Histoire et description generale de la Nouvelle-France," vol. 4 (1744). Considerable additions were made to the knowledge of the Canadian flora by André Michaux in his "Flora boreali-americana" (1803), and by his son François André Michaux, author of "Histoire des arbres forestiers de l'Amerique septentrionale" (1810-13), which appeared in English under the title of "The North American Sylva" (1859). The first flora of the Quebec region, however, was Provancher's "Flore Canadienne" (1862), which served for three-quarters of a century as the breviary of French Canadian amateur botanists.

The area of the "Flore Laurentienne" may be divided into three distinct phytogeographic regions: (1) the low alluvial plain of the St. Lawrence, formed of palaeozoic sedimentary rocks covered by glacial drift and by beds of sand and clay deposited during the Champlain period; (2) the Laurentidian region to the north, formed of pre-Cambrian gneiss with intrusions of granite, basalt and syenite; and (3) the Alleghanian region to the south, of complicated geological structure, including extensive calcareous formations, argillaceous schists, intrusions of serpentine, Cambrian quartzites and granitic intrusions.

The alluvial plain of the St. Lawrence falls within the zone of broad-leaved trees which extends also southwards into the Alleghanian region. Northwards and north-eastwards comes the zone of mixed forests, and still further to the north, the transitional zone which extends to the Hudson-St. Lawrence watershed, Lake St. Jean and the Saguenay river. Beyond this come the northern

coniferous forest zone and the subarctic forests. The Laurentian region, generally, is characterized by the presence in considerable quantity of *Acer saccharum*, *Betula lutea*, *Pinus resinosa* and *Pinus Strobus*.

Nearly sixty pages (pp. 20-78) are devoted to a general sketch of the flora of the whole Province of Quebec, which the author divides into the following regions: "1, Région arctique; 2, Région hudsonienne; 3, Région laurentienne, (a) Sous-région du Bouclier précambrien, (b) Sous-région apalachienne, (c) Sous-région de la plaine alluvionnaire du Saint Laurent." Owing to the discursive style in which this sketch is written, it is almost impossible to summarize: indeed it would have gained greatly by elimination of generalities which have little connection with the essential subject-matter.

During the lower Cretaceous period the north American continent was covered by a more or less uniform forest of Gymnosperms. This was divided at the end of the upper Cretaceous period into two areas, western and eastern, separated throughout their length by an extensive tract of sea running north and south. To this fact is attributed the differentiation in the Coniferae of eastern and western North America: the eastern species, *Abies balsamea*, *Larix laricina*, *Pinus Strobus*, *Pinus Banksiana* and *Thuja occidentalis* are represented in the west by *Abies lasiocarpa*, *Larix Lyallii*, *Pinus monticola*, *Pinus Murrayana* and *Thuja plicata* respectively. A map of America and Europe during the Eocene period, showing land bridges north and south of the Tethys sea, is introduced to account for the relationship between the floras of eastern North America and western Europe, which is shown by the occurrence in the two areas of the same or representative species. Reference is made also to the effects of the Glacial period on the Quebec area, and to the peculiar flora of the nunataks found in this region. A map on p. 77 shows the distribution on the St. Lawrence, at the end of 1933, of *Butomus umbellatus*, a European plant first observed about the year 1897. This is rapidly spreading along the St. Lawrence, and displacing native species such as *Scirpus acutus*, *S. fluviatilis*, *S. americanus*, *Sparganium eurycarpum*, *Zizania aquatica*, *Sagittaria latifolia* and *S. heterophylla*. A short bibliography, containing references to original sources of information, might have been usefully appended to this section.

Dr. Marie-Victorin is to be congratulated on the successful completion of his flora of Southern Quebec. The hope may be expressed that he will now prepare, on somewhat less popular lines, a flora of the entire Province of Quebec. High praise is due to Frère Alexandre for the excellent and well-chosen illustrations which add so greatly to the value of the work.

T. A. SPRAGUE.

**The London Clay Flora.\***—In this handsome monograph, based upon an intensive study of the London Clay fruits and seeds by the method of comparative anatomy, palaeobotanists now have the up-to-date and scientific account of this flora so long desired. The book is divided into two parts, an introduction (pp. 1-90), including a full account of previous research, the geology of the formation, methods of palaeobotanical research, the botany of the London Clay with a list of species, the distribution of the living representatives, a comparison between the London Clay and later Tertiary floras, climate, and the relation of the London Clay flora to other Tropical Eocene floras. The main body of the work (pp. 91-541) deals with the systematic description of the flora itself. This will remain as a permanent monument of careful research and study. It is the result of seven years intensive concentration upon a fossil flora of special interest because of its immediate bearing upon the evolution of plants, and of its plain evidence of a tropical climate in British Eocene times. The authors, familiar figures at Kew, make full and generous acknowledgement of assistance rendered by the Herbarium staff.

The work is largely based upon the collection of Dr. James Scott Bowerbank, containing over 120,000 fruits and seeds, of which 25,000 were purchased in 1865 by the British Museum, supplemented by later additions and material collected by the authors. They pay high tribute to Bowerbank's work, which "has stood for years as a model of what palaeobotanical study and exposition ought to be." Of Francis Crow they state that "he was the first to suggest the method of study which is the method we have continually used in our investigation of the London Clay fruits and seeds [that of opening and displaying their internal structure]."

In discussing the geology, the climate, as shown by the fauna, is held to be tropical, but as there were some temperate mollusca the London Clay was no doubt laid down in a sea beyond the mouth of a great river which communicated with the warm Tethys or Nummulitic sea, conditions such as Moseley on the Challenger Expedition found on the Ambernot River, New Guinea.

In part 4, dealing with the practical study of material and methods of research adopted, the importance of extensive collecting and studying living fruits and seeds is emphasised, and the mode of preparation of fossil material described. Only by means of the comparative method was the elucidation of the various states, mineral and vegetable, of the fossil fruits by laboratory methods made possible. Work commenced in 1926 at Kew. The authors say "usually it was by reference to our own collection of living

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\* By Mrs. Eleanor Mary Reid and Miss Marjorie Elizabeth Jane Chandler. Published by the Trustees of the British Museum. 4vo. Pp. 561 + viii, with 33 plates and 17 figures in the text, issued 25th November, 1933. Price £2 10s. 0d. We much regret the delay in the publication of this review.

forms and to our drawings that we were enabled to make preliminary suggestions as to relationship, but full comparison was always afterwards made with material at Kew. When an alliance with one or more families was suggested, we then in Kew Herbarium made as intensive a study of the family or families as possible." The results of these studies will be seen in the systematic part. The authors found some fossils revealed better than living plants such features as the mode of germination or character of successive coats. Fossil fruits were studied by the same method as that used for living fruits and seeds, and as sections were prohibited by the number required, fracture with cutting pliers and dissection were employed to reveal internal structure, an irregular fracture being the best to study the integuments.

The London Clay Flora includes 234 named and 80 unnamed species. None affords evidence of affinity with present floras. They embrace 70 tropical genera related most nearly to those of the Malayan Peninsula, the decrease in wide-ranging genera from Pliocene times being due to the increasingly temperate climate, and separation of the British Isles from the Continent. The warmer elements in the London Clay flora are explained by the occurrence of *Nipa*, living species of which flourish in brackish water on tidal mudflats. *Nipa* travelled along the shores of the Tethys sea from Malaya to the Anglo-Belgian basin. To account for the warm climate phase, a general survey of meteorological and climatological principles and theories as to climatic changes in the past was undertaken. *Nipa* shows that the flora was not an alien one swept down by a great river. Change in world physiography is discussed, and the authors reject Wegener's geophysical hypothesis and favour that of Brooks, his views harmonizing more or less with their own.

In the systematic account, the descriptions in English are well drawn up, based on the material figured in 33 4vo. plates from photographs by Miss Chandler, with helpful explanations. A number of new families, genera and species are described. There is a full bibliography and an excellent index. Misprints are few and the work is printed in clear type on good paper. The authors must be heartily congratulated on the completion of their work, so well done in every way and indispensable to all students of fossil botany.

A. R. HORWOOD.

**The Living Garden.\***—The eternal dichotomy between the "Scientist" and the "Practical Man" probably attains its most striking expression in man's activities as a cultivator. The gap is, however, becoming less wide. Farmers have been well served in recent years by a number of books on the scientific background

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\* By E. J. Salisbury, D.Sc., F.R.S. G. Bell & Sons, Ltd., London, 1935. Pp. xi+338. Ill. by 17 plates and many text figs., the latter mostly by Gwendy Caroe. Price 10s. 6d. net.

of their calling, but gardeners have long been awaiting such a volume as Professor Salisbury has now given them. Its title, "The Living Garden," with its implied contrast to *Hortus Siccus*, indicates the author's aim, which is to help create a body of horticulturists who will treat their gardens, not only as places of beauty or as arenas in which to prove their skill, but also as experimental grounds giving them "unrivalled opportunities for observing living plants at all stages, under most varied conditions, such as are often denied to the Scientist."

Professor Salisbury's treatment of the subject is admirable and judging from the encouraging sales that are reported he should be successful in spreading his ideas among a large section of the horticultural public.

In the first chapter the background of the subsequent treatment is sketched. A garden is defined ecologically as a community in which competition is reduced to a minimum by human interference and in which the various constituents exist, not because they are specially fitted for their position, as in a natural community, but because knowledge and skill here enable the cultivator to impose on a natural community his whims and fancies.

The various factors that underlie his skill and on which his success depends form the subjects of the rest of the book. Chapter titles such as The Soil ; Sunlight and Shade ; Cold and Warmth ; Frost and Fog ; The Spring Emergence ; Seeds and their Germination ; Plant Names ; and the Span of Life, indicate the wide range of topics discussed. In each chapter Professor Salisbury draws on his knowledge as an experimental botanist and as a practical gardener to explain, in language that is never over technical, the principles underlying garden technique. The one or two errors in the chapter on plant names will doubtless be corrected in a second edition.

The photographic plates are excellent, as are the majority of Mrs. Caroe's drawings. In some cases, however, notably in the figure of lily-of-the valley on p. 121, which has the appearance of a water plant emerging from a pond, accuracy has surely been sacrificed to artistic effect.

As a contribution towards bridging the gap between botanist and horticulturist Professor Salisbury's book should be warmly welcomed by the exponents of both branches of plant study.

**The Liverpool Herbarium.\***—The authorities of the Liverpool Museums are to be congratulated on issuing this valuable guide to their extensive herbarium collections. Mr. H. Stansfield, the Keeper of the Department of Botany, has compiled a work which will be of great interest not only to local naturalists but also to a much wider circle of readers who are concerned with botanical studies.

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\* Handbook and Guide to the Herbarium Collections in the Public Museums, Liverpool. 1935. Pp. 81, Plates 14. Price 6d.

The Liverpool Museum is fortunate among similar institutions in possessing in addition to a valuable local herbarium several important foreign collections, which previously formed part of the Liverpool Botanic Garden Herbarium. Among these are collections by Bradbury (N. America) ; Pallas (Russia and Siberia) ; Forster (South Sea Islands) ; Nuttall (N. America) ; Heldreich (Greece) ; Roxburgh (India) ; Wallich (India) ; and others of equal interest. These came to the Liverpool Garden in its early days when its first Curator, John Shepherd, was in touch with famous botanists all over the world, and passed to the Museum Herbarium in 1909. Among the more important local collections are those of J. W. Ellis (1857–1916), Robert Brown (1839–1901), Charles Bailey (1838–1924), and John Shepherd (1764–1836), who, with Dr. Bostock, discovered at Formby that mysterious plant *Centaureium latifolium*, a photograph of which is given.

The various collections are described under the heading of the collector's name, biographical details, photographs and references to publications being given in each case. Sheets from some of the larger collections are also illustrated and the handbook concludes with a note on the preparation of plants for the herbarium.

This guide, which is extremely cheap at sixpence, will certainly stimulate interest in one of the most extensive and up-to-date botanical collections in any provincial museum.

**Hooker's Icones Plantarum.\***—Part 3, of vol. 3, of the Fifth Series, published in August 1935, contains 25 plates with analyses of vascular plants from the Balkans (4), subtropical Asia (5), Australia (5), tropical Africa (8) and tropical South America (3). It includes descriptions of one new genus and fifteen new species, besides illustration<sup>c</sup> of six recently (1931–35) described species.

A special feature of this part is the greatly extended text accompanying two of the plates, although the price (10/-) remains the same. The letterpress of t. 3261, *Echinopogon intermedius* (Queensland and New South Wales), runs to ten pages, including a key to and descriptions of the seven known species, six of which are new. *Echinopogon ovatus* and other species are commonly known as "Rough Bearded Grass" and are dangerous to stock, causing a peculiar form of staggers. This revision of *Echinopogon* alone makes the part indispensable to agrostologists as well as to students of the Australian flora. Appended to the description of the new genus *Sclerandrium* (t. 3262) (*Gramineae*—*Andropogoneae*) is a key to and an enumeration of the twelve genera now referred to the group *Polliniastreae*. *Sclerandrium* itself is based on *Ischae-*

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\* Hooker's Icones Plantarum ; or, figures, with descriptive characters and remarks, of new and rare plants, selected from the Kew Herbarium. Fifth Series. Edited for the Bentham Trustees by Sir A. W. Hill, K.C.M.G., Sc.D., F.R.S., Director, Royal Botanic Gardens, Kew ; Honorary Fellow, Kings College, Cambridge. Vol. 3, Part 3 (London, Dulau & Co., 1935). Price 10s.



*mum truncatiglume* F. Muell. (Northern Australia), the three other species included in the genus being *Lophopogon intermedius* A. Camus and *L. tenax* Balansa, both natives of Indo-China, and an undescribed one collected by Dr. A. F. G. Kerr in Siam. *Ischaemum fragile* (t. 3263) was the basis of the genus *Digastrium*, which is now shown to be closely linked with *Ischaemum* proper by means of a newly described species, *I. Baileyi*, also from Queensland. *Zoisia macrantha* (t. 3264), a native of Australia and Tasmania, is commonly known as "Coast Couch Grass" or "Prickly Couch Grass," and is of considerable importance as a sand-binder. The roots and rhizomes form a network which consolidates drifting sand, whilst the culms appear to be able to grow up through increasing layers of sand, branching freely and rooting at the nodes.

Specialists in the *Ericaceae* will be interested in the plate of *Agapetes linearifolia* (t. 3255), a species originally described from sterile specimens collected in the Mishmi Hills, Assam, by Griffith in 1836. The flowers were unknown until the plant was re-collected by Kingdon Ward in 1928. Four recently described and inter-related species of *Agapetes* are also illustrated (tt. 3256-3259). The *Acanthaceae* are represented by three new species from tropical Africa (tt. 3266-3268). *Blepharis Hornbyae* (Tanganyika Territory) with beautiful blue, rose-purple or white flowers, is a trailing plant using the evergreen shrubs for its support much in the same way as *Lonicera Periclymenum* does in Europe. *Anisotes umbrosus* and *A. bracteatus*, both also from Tanganyika Territory, are referred to the genus *Anisotes* on account of the structure of their corollas, although their general facies is rather that of *Adhatoda*. The tropical African *Orchidaceae* are represented by four species of *Disperis*, very much alike in general facies, but differing greatly in the structure of their flowers. *D. dicerochila*, a new species from Uganda and Kenya Colony, has a labellum resembling to a remarkable extent the head of an animal bearing two erect horns. *Exochogyne* (tt. 3273-3275) a South American genus of *Cyperaceae*, was previously considered monotypic. Three species are now figured, the two new ones being *E. megalorrhyncha* from British Guiana and *E. decandra* from the Rio Negro, Brazil.

*Mariscus Bowmanii* (t. 3260) is a native of Queensland, where it appears to be definitely coastal and to be restricted to open *Eucalyptus* forest. *Pentas magnifica* (t. 3265) a suffruticose Rubiaceae plant from Tanganyika Territory has a corolla 6 in. long with a limb 2 in. in diameter.

*Hypericum thasium* (t. 3251) is the sole known representative of the section *Thasia* Boiss., distinguished by the herbaceous habit, subpentadelphous stamens, 5 styles, 5-locular ovary, 5-valved capsule and equal calyx segments which do not enlarge in fruit. Originally described from Thasos, it has since been found in Thrace and South Bulgaria. *Astragalus glycyphylloides* (t. 3252), to which *A. serbicus* is now reduced, is widely distributed in the Balkan Peninsula, Crimea, and Bithynia as well as in the Caucasus, where

it was originally discovered. *Verbascum gracile* (t. 3253) is a new species collected by Mr. H. G. Tedd in Thrace. *Polygonum icaricum*, first found in Ikaria (Nikaria) has now been discovered by Mr. Tedd in Samothrace.

**Bibliography of Soil Science.\***—This volume consists of the references published in the first four lists of soil publications issued from the Bureau at Harpenden, arranged according to the Universal Decimal System of Classification of the Institut International de Bibliographie, Brussels. In the explanatory preface this system is explained and the views of readers on its use in the present work are solicited. After the main list of references there follow a subject index, a list of abbreviations of journals, and an author index.

As far as one can tell from a few trial uses, the compilers have done their task exceedingly well and carefully, both as regards the fitting of the subject matter into the decimal classification and in making the two indexes. It is to be hoped that many branches of science, both pure and applied, will come into line with similar bibliographies. With the present-day output of research, these are becoming increasingly necessary. Pedologists, at any rate, are now well served in this respect.

**Fungi of South Australia.†**—In the previous issues of this journal (K.B. 1922, 254 ; 1924, 303 ; and 1930, 398) there have appeared reviews of a most useful series of handbooks of the Flora and Fauna of South Australia, which is being issued by the Australian branch of the British Science Guild.

In 1934 there appeared the first part of a new volume in this series, a work on the larger fungi by Dr. J. B. Cleland, and the second part was published in June, 1935. There is urgent need for up-to-date Fungus-Floras of our Dominions and Colonies, since mycological knowledge has extended enormously during the past 25 years. Hence we welcome a book such as this, the result of first-hand knowledge of an active field mycologist, who has checked his determinations by correspondence with specialists in other parts of the world.

The first part, dealing with *Agaricaceae*, begins with a short account of the higher fungi in general, with reference to their uses, injurious properties, and various interesting phenomena. Following

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\* Bibliography of Soil Science, Fertilizers and General Agronomy, 1931-1934. Imperial Bureau of Soil Science, Harpenden, 1935. Pp. xxxi + 473. Price 25s.

† Toadstools and Mushrooms and other Larger Fungi of South Australia, by J. B. Cleland.

Handbooks of the Flora and Fauna of South Australia issued by the British Science Guild, Australian Branch. Part I. June 1934, General Introduction and Toadstools and Mushrooms ; Part II. June 1935, Remaining Hymenomycetes, Gasteromycetes, the larger Ascomycetes and Mycetozoa. Pp. 362, 10 col. plates, 77 text-figures ; price 5s. each part.

this is a glossary explaining technical terms. The main part of the work contains keys to families, genera, and species, with full descriptions of all the species of *Agaricaceae* so far recorded from South Australia. The second part deals in similar manner with the remaining groups of homobasidial Hymenomycetes, Heterobasidiae, Gasteromycetes, some larger Ascomycetes and Mycetozoa. An interesting new species of *Lentinus* found on railway sleepers is described.

There are ten excellent coloured plates, chiefly from charming water-colors by Miss P. Clarke, and 77 uncoloured figures reproduced from photographs of the actual plants or from drawings. At the end of part 2 is an index to the whole.

The work is well produced and can be thoroughly recommended as a guide to the larger fungi of Australia, as far as they are known. At the very modest price of 5s. each part it is remarkably good value.

E. M. WAKEFIELD.

**Dictionary of Phanerogamic Genera.\***—The recent publication of volume 6 completes this work of reference which will be very valuable in all botanical libraries. The first volume appeared in 1929, and in each successive year, except 1934, a further volume was added. The scope of such a work demands an exhaustive search of botanical literature, as well as expert knowledge of taxonomy and nomenclature, and the author is to be congratulated on finishing the dictionary in six years.

The general plan is the same throughout, the classification being on the whole according to Engler's Syllabus, 1924. The arrangement is strictly alphabetical, each accepted generic name is followed by the name of the author, the place of publication, the family to which it belongs, a technical description in French, the number of species in the genus, the geographical distribution, and finally any generic synonyms. Synonyms are also indexed in their correct alphabetical sequence with appropriate cross references. From volume 2 onwards a greater number of synonyms is included than in the first volume, a distinct advantage to systematists.

The work is brought up to date by the inclusion in each volume of a supplement. In supplements 5 and 6, for instance, many amendments and corrections are included from the family *Sapindaceae* owing to the appearance of Radlkofer's Monograph in Engler's "Pflanzenreich" (1931-1934). Several other similar examples could be enumerated which would show that the work was continually being brought up to date.

In order to facilitate consultation of the whole work, and to avoid generic names appearing in supplements being overlooked,

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\* Dictionnaire descriptif et synonymique des genres de plantes phanérogames, par Albert Lemée. i—vi (1929-1935), Brest, Imprimerie Commerciale et Administrative, 17, rue d'Algésiras. London, Dulau & Co., 32, Old Bond Street.

the author has included in the last volume a number of small labels equal to the number of names of genera in each supplement. These he suggests should be pasted in the margins of the volumes. For those genera that have been *revised* in the supplements, the labels should be placed in front of the generic names in the Dictionary, and for those genera that have been *added* the labels should be placed in the blank space which separates the two genera between which the added genus should be inserted.

The general format of the work is generous and pleasing, and the print throughout is good. A complementary volume is anticipated by the author in which he hopes to present an analytical table of the families and genera for the determination of phanerogamic plants from all regions of the world.

The author is certainly to be congratulated on the successful completion of his laborious undertaking, and on bringing together in one work of reference the essential characters of phanerogamic genera.

M. L. GREEN.

**Garden Variety.\***—Practical gardeners will be very grateful to Lady Hort for having edited Sir Arthur Hort's last book, which he had almost completed before his untimely death in March 1935. Like his earlier work, "The Unconventional Garden," it contains a wealth of useful practical information and sound commonsense in garden craft. The book has the great merit of being written by one who was not only a fine classical scholar with a great knowledge of plants both in their native haunts and under cultivation, but who was also a real gardener who knew the delight of taking off his coat and working with his own hands. Sir Arthur is thus able to give the results of his own experience in the handling of plants, coupled with many shrewd and valuable observations on matters of botanical and horticultural interest, which only those who practise the art with the perceiving eye can fully appreciate. The touch of humour throughout the book and the interest added to it from his knowledge of the Classics brings the author vividly before one as one reads. Here and there, those who were privileged to know him well can almost hear his voice in some characteristic remark about a plant or an incident.

The references to the origins of plant names and the allusions to historical associations and country lore, together with pleasing quotations from Gerard's Herbal, Theophrastus and other sources add much to the interest of the book.

Towards the end Sir Arthur gives some interesting particulars about our native plants worthy of cultivation and some sound advice as to how and how not to collect plants for the garden both at home and in the Alps.

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\* By Sir Arthur Hort. Edward Arnold & Co., London, 1935. Pp. 255. Price 10s. 6d.

The book is in four parts—"The four seasons follow in their course and all things come to life"—Winter, Spring, Summer and Autumn. In each section the author reveals himself as a sage bringing from his treasure house things new and old.

Lady Hort's hope, expressed in her preface, that the book will help to keep Sir Arthur's "memory to his friends as a living force and not a mere recollection" is certainly fully justified and also strengthened by the charming and characteristic photograph of the author in his garden.

A. W. H.

**The Lily Year-Book.\***—The Lily Year-Book for 1935, published by the Royal Horticultural Society, maintains the standard of its predecessors, and is of value alike to botanists and horticulturists. Of scientific interest are the papers recording experiments on drainage-conditions as affecting lily growth which have been conducted by Dr. M. A. Tincker in the laboratories at Wisley, and on vegetative propagation of lilies by the late Dr. D. Griffiths of the U.S.A. Bulb Station at Bellingham, Washington. The list of lily names and synonyms prepared by Dr. F. Stoker is of special value. This list has been compiled with great care, the author, having recognized the pitfalls of plant naming, has wisely sought the advice of experts, so that the list is accurate, not only taxonomically but also as regards nomenclature. A very readable contribution is the article by T. Hay, who deals with important lily literature from the 16th Century onwards. The remaining articles chiefly concern the different aspects of cultivation, though various other subjects of interest to lily-growers are touched upon.

**Third Imperial Botanical Conference.**—The Report of the Proceedings of the Third Imperial Botanical Congress held in London, August, 1935, has now been published and may be obtained from the Royal Botanic Gardens, Kew, price 1s. An account of the various communications is given, together with a list of members, and references to the place of publication of much of the work described.

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\* Lily Year-Book, No 4, 1935 Royal Horticultural Society : London, 1935 Pp. 140 ; 30 figs Price 5s paper, 6s cloth.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 2, 1936 ROYAL BOTANIC GARDENS, KEW

## XVII—TECHNICAL TERMS IN RUELLIUS' DIOSCORIDES. \*—T. A. SPRAGUE.

The publication of the present paper completes an arduous task undertaken several years ago. Together with the companion glossaries of botanical terms used by Pliny, Isidorus and Albertus Magnus, it contains materials for a history of botanical terminology from the first to the sixteenth century of the Christian era, and affords a basis for the interpretation of the Latin descriptions of plants given in the sixteenth-century herbals. In order to make the glossary more complete and more generally useful, various medical and pharmaceutical terms have also been included.

The *Materia Medica* of Dioscorides, in addition to being the main source of our knowledge of the vegetable drugs employed under the early Roman Empire, casts interesting side-lights on daily life during that period. That the Romans used small lengths of cane (*calamuli*) for brushing their teeth, is shown by an incidental remark of Dioscorides, that the green twigs of *Pistacia Lentiscus* were employed instead of little canes for this purpose: "Virentes surculi calamulorum vice dentibus repurgandis affricantur" (Diosc. Mat. Med., ed. Ruellius, lib. i. cap. 88).

A henna-shampoo, used for dyeing the hair yellow or reddish, was obtained by pounding up henna leaves which had been previously macerated in the juice of soapwort (*Saponaria officinalis*): "Capillum ruffant trita folia, quae in radiculae succo maduerint" (l.c. 126); "Luteos reddunt capillos trita et illita folia, quae in struthii succo maduerint" (Diosc. Mat. Med., ed. Sprengel, lib. i. cap. 125). Other yellow hair-dyes were yielded by *Rhamnus infectorius* (Ruellius op. cit. i. 134), *Zizyphus Lotus* (l.c. 173), and *Xanthium strumarium* (iv. 139), and various black hair-dyes were also in use, obtained from *Acacia vera* (i. 135), *Quercus Ilex* (i. 146), oak galls (i. 148), *Rhus coriaria* (i. 149), *Myrtus communis* (i. 157), *Hedera Helix* (ii. 199), *Salvia* sp. (iii. 38), and *Sambucus Ebulus* (iv. 185). Eyebrows and eyelashes were blackened by vegetable soots obtained by burning the resin of certain Coniferae (i. 86, 94). Oil made from wild olives

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\* See "Botanical terms in Pliny's Natural History" (K.B. 1933, 30); "Botanical terms in Isidorus" (l.c. 401); "Botanical terms in Albertus Magnus" (l.c. 440); "Plant Morphology in Albertus Magnus" (l.c. 431).

was used to prevent the falling of hair, and to keep it from prematurely turning gray (i. 34), and a hair tonic was made from myrrh and ladanum mixed with myrtle oil and wine (i. 77, 130). Bears' grease was said to make hair grow again (ii. 86). A creamy extract of fenugreek flour was employed for cleansing the hair (ii. 112).

Among the numerous specifics for clearing and beautifying the complexion were Sicyonian oil (i. 35), almond oil (i. 39), mastic oil (i. 50), oil of fenugreek (i. 56), oil of bitter almonds (i. 178), the fat of geese and poultry (ii. 77), lizard dung (ii. 90), Sardinian honey (ii. 92), bitter vetch flour (ii. 119), lupin flour (ii. 120), and the juice of the gourd, *Cucurbita Pepo* (ii. 151). The latex of *Euphorbia Characias*, mixed with oil, was used as a depilatory (iv. 169).

Then as now, cosmetics and medicines were largely prepared side by side, and sold in the same shop. According to Wootton (Chronicles of Pharmacy, 1, 94), *seplasia* was the ordinary name for a druggist's shop, and those who kept them were called *seplasiarii* or *pigmentarii*. Originally the seplasiarii were ointment-makers, while the pigmentarii sold dyes and colours, but the two designations seem to have become more or less interchangeable, and *pigmenta* came to include drugs as well as pigments.

The relations subsisting between the physicians and the druggists appear to have been much the same in ancient Rome and sixteenth-century Germany, judging from parallel passages in Pliny's Natural History and Fuchs's Historia, even allowing for a certain amount of plagiarism on the part of the latter writer. Dioscorides, in the introduction to his Materia Medica, states that the physicians of the Asclepiad school who wrote on drugs gave only a superficial account of their properties and diagnostic characters, and that they confused one drug with another. Pliny mentions that the physicians of his day knew nothing about the compounding of certain classes of medicaments and entrusted these matters to the seplasiarii, who supplied spoiled or adulterated drugs: "Atque haec omnia medici (quod pace eorum dixisse liceat) ignorant, pars major et nomina: in tantum a conficiendis medicaminibus absunt, quod esse proprium medicinae solebat. Nunc quoties incidere in libellos, componere ex his volentes aliqua, hoc est, impendio miserorum experiri commentaria, credunt seplasiae omnia fraudibus corrumpenti. Jam quidem facta emplastra et collyria mercantur: tabesque mercium, aut fraus seplasiae sic exteritur" (Plin. Hist. Nat., ed. Harduinus, 2, 661: 1723). Fuchs states that hardly one out of a hundred contemporary physicians in Germany had an accurate knowledge of even a few kinds of plants, and that they thought this kind of information did not concern them and was beneath their dignity; hence they left the study of medicinal plants to the druggists and the superstitious and foolish old peasant women (Fuchs, Historia, fol α 3 verso: 1542).

The extent to which falsification of medicaments was practised in the time of Dioscorides may be judged from the fact that he

mentions particular methods of adulteration or substitution and means of detecting them in fifteen out of his first 83 chapters. The root of *phu* (*Valeriana Dioscoridis*), for example, was adulterated with that of *ruscus* (*Ruscus aculeatus*), which might be detected by being hard and difficult to break and by the absence of a pleasant smell. Frankincense was adulterated with pine resin and gum.

Over forty chapters of the *Materia Medica* are devoted to the preparation of oils and unguents. Astringents, known as *spissamenta* (σπύσματα) were added in order to preserve and thicken the oil, and to make it more retentive of the desired perfumes, which were supplied by the addition of various *odoramenta*. Further details are given by Sprengel (*Diosc. Mat. Med.*, ed. Sprengel, 2, 367). The word *spissamentum* is, by a curious error, translated as "a stopple, plug" in Lewis and Short's *Latin Dictionary* (1922), but the corresponding word in the Greek text, namely σπύμμα, is correctly rendered as "an astringent esp. used for thickening oil that it may retain scent better" in Liddell and Scott's *Greek-English Lexicon*.

Among the various forms of medicament were *acopa*, *cataplasmata*, *malagmata*, *eclegmata* and *catapotia*. An acopum was a liniment, which might be either soothing or stimulating in its action. Cataplasmata were either plasters or poultices, and malagmata were emollient poultices. An electuary or looch, that is, a thick syrup to be swallowed slowly, was known as an eclegma. Catapotia were pills, and if composed of some irritant substance, they were coated with wax or honey (Ruellius, op. cit. iv. 169). The use of *Mandragora* as an anaesthetic in cases of amputation or cautery is mentioned by Dioscorides: "Obdormescit enim homo, eo fere quo comederit habitu, sensus impos, ternis quaternisque ex quo data est horis. Hac medici utuntur, cum scindendi, urendique necessitas adest" (iv. 179).

Medicinal drinking-cups were made of the wood of *Tamarix gallica*, in the belief that liquid which had stood in them was beneficial in diseases of the spleen: "Potorios calices e caudice lienosis moliuntur, quo datus in his potus proficiat" (i. 118). An interesting parallel is afforded by the drinking-cups made from the so-called *lignum nephriticum*, "which was celebrated throughout Europe in the sixteenth, seventeenth and the early part of the eighteenth centuries [sic], not only for its reputed virtues but on account of the strange colour phenomena displayed by its infusion in spring water" (Safford in *Ann. Rep. Smithson. Inst.* 1915, 271). The wood was obtained from *Eysenhardtia polystachya* (Mexico) and *Pterocarpus indica* (Philippines), but the famous drinking-cups appear to have been made exclusively from the latter. Water left standing in them acquired a brilliant blue fluorescence, and was in high repute as a specific against diseases of the kidneys.

Among the more valuable drugs described by Dioscorides were Aconite, Opium, Liquorice, Colocynth, Henbane, Castor Oil, Colchicum, Aloes and Squill. Of minor importance but still in use, and



included in the British Pharmaceutical Codex, 1934, were Stavesacre, Marshmallow, Rue, Mastic, Pomegranate Root Bark. Elatium, Dill, Anise, Coriander, Fennel, Hemlock, White Horehound, Pennyroyal, Rosemary, Lavender, Psyllium, Mezereon, Orris, Saffron, White Hellebore and Couch Grass. Couch grass is still used as a demulcent diuretic, and Pomegranate Root Bark is still employed in the form of a decoction to expel tape-worm.

Remedies for diseases of women are perhaps first in point of numbers, and numerous specifics for procuring abortion are mentioned. Next come drugs used in affections of the urinogenital tract, and palliatives for stomach-ache and intestinal pains (*tormina*). The prevalence in southern Europe and the Near East of diseases of the eyes and skin is reflected in the large number of remedies for complaints of this nature. The frequent mention of specifics for reducing the spleen is interesting in connection with the theory that chronic malaria was an important factor in the decline and fall of the Roman Empire. Palliatives for toothache included Colocynth, the resin of *cancamum* (*Commiphora* sp.), the bark of *platanus* (*Platanus orientalis*) macerated in vinegar, a decoction of tamarisk (*Tamarix gallica*) leaves mixed with wine, oak-galls, the resin of *Rhus coriaria*, a decoction of the bark and leaves of the mulberry, the latex of the fig, that of *Euphorbia Characias* mixed with oil, a decoction in vinegar of the roots of *Rumex* spp., a decoction of the root of *asparagus* (*Asparagus acutifolius*) and of that of *plantago* (*Plantago* spp.). The sediment of olive oil (*amurca*), mixed with the juice of unripe grapes, and cooked to the consistency of honey, was smeared on decayed teeth in order to loosen them.

A kind of beer, called zythum or zythus (ζύθος), was prepared in Egypt from barley, and Dioscorides states that ivory when macerated in it was rendered more easily workable. This passage is especially interesting in connection with the large slabs of ivory known to have been used by ancient artists, and the assumption that these artists possessed a method of softening, bending and flattening the substance, the secret of which has now been lost (see Chambers Encyclopaedia, 6, 257 : 1906). A learned commentary on zythus is given by Sprengel (Diosc. Mat. Med. ed. Sprengel, 2, 454 : 1830). The passage in Dioscorides was misunderstood by Ruellius (ii. 96). Sprengel translates it : "Tractabile ebur redditur eo maceratum." The Greek text accepted by Wellmann (Dioscurides. Mat. Med. ii. 87) is as follows :—"εὐεργής δὲ καὶ ὁ ἐλέφανς γίνεται βρεχόμενος αὐτῷ."

Comparatively few superstitious practices are recorded by Dioscorides. In view of the widespread survival at the present day, particularly in the East, of a belief in the potency of amulets and mascots, it is not surprising to find *anchusa alia* (*Echium* sp.) mentioned by Dioscorides as an amulet against snake-bite, and *polemonia* (a plant of doubtful identity) as an amulet against the bites of scorpions. The juice of *anchusa alia*, if spat into a serpent's mouth, was said to kill it. The third joint (from the ground) of the

stem of vervain (*Verbena supina*) was used as a remedy for tertian fevers, and the fourth joint for quartan fevers. Great precautions were taken when digging up black hellebore (*Helleborus officinalis*), lest the act should be observed by an eagle, when death would follow.

Turning now to the technical terms employed by Ruellius, the need for a glossary is due to several causes:—(1) Certain of his terms for parts of the human body now denote quite different parts. Thus by *arteria* he meant, not an artery, but the windpipe; *vena*, instead of being a vein, was a urinary passage; and *nervus* was a tendon, not a nerve.—(2) Some words which are now botanical terms were used by Ruellius with their original common meaning: *funiculus*, as a cord or thong; *pistillum* as a pestle; *pollen*, as flour or powder; and *ramenta* as scrapings or shavings.—(3) Various modern botanical terms were employed by him in several, or sometimes many, different morphological senses, examples being *acinus*, *ala*, *calyculus*, *calyx*, *capitulum*, *cortex*, *corymbus*, *flos*, *folium*, *folliculus*, *nucleus*, *putamen*, *semen*, *siliqua* and *umbella*.—(4) Ruellius in various instances used several different terms for the same morphological entity. Thus the drupe of *Rhus* was an *acinus*, while that of *Prunus* was a *bacca* or *pomum*. An umbel was termed by him *corymbus*, *caput*, *capitulum*, *calyx* and *muscarium* in addition to *umbella*. A capsule might be *caput*, *capitulum*, *calyx* (all three terms being applied to that of *Papaver*), *folliculus* or *siliqua*. A tendril was *capreolus* or *clavicula* or *pampinus*.—(5) The mediaeval spelling adopted by Ruellius in many instances is apt to disguise the words concerned. The letter "e" was frequently replaced by "ae" as in *aedere*, *caera*, *haerba*, *praelum*, *procaerus*, *quaercus*; "i" and "y" are sometimes interchanged as in *cariota* and *desyderare*, as well as in *sylvestris*; "t" or "s" may become "c", as in *duricia*, *spacium* and *ceu*; *omnes* and *tres* become *omneis* and *treis*. The spellings *praestis* and *syncaerus* represent *pristis* and *sincerus* respectively, and *rufus* is spelt *ruffus*. Ruellius, however, was not always consistent: thus he had both *spacium* and *spatium*, and *sepes* as well as *saepes*.

The precise connotation of the various terms employed by Ruellius has been determined in the following way. Where the meaning was not obvious, the first step was to identify the plant concerned. Here recourse was had in the first instance to Sprengel's commentary (*Diosc. Mat. Med.*, ed. Sprengel, 2, 339–675: 1830), which is more reliable than the list of identifications appended to Daubeney's *Lectures on Roman Husbandry* (1857). Where apparently the same plant was mentioned by Theophrastus, the list of identifications by Thiselton-Dyer in Hort's edition of Theophrastus (2, 437–493: 1916) was consulted. Goodyer's English translation, published by Gunther (1934), was very helpful, the reproductions of the drawings in the Vienna Codex being especially valuable. A few identifications have been obtained from the section "Flora" written by Thiselton-Dyer in Whibley, *Companion to Greek Studies*, ed. 3 (1916), 52–68, and from the corresponding section, by the same

writer, in Sandys, *Companion to Latin Studies*, ed. 3 (1921), 66–89. Thiselton-Dyer's learned paper "On some ancient plant-names" (*Journal of Philology*, 33, 195–207, 34, 78–96, 290–312) contains critical identifications of 26 plant-names mentioned in the ancient Greek writers. Isolated determinations have also been obtained from other sources.

Where the exact meaning of a Latin word, as employed by Ruellius, could not be obtained from Lewis and Short's *Latin Dictionary*, the corresponding word in the Greek text (in Sprengel's edition) was looked up in Liddell and Scott's *Greek-English Lexicon*.

The meaning of each word has been checked by study of the context in each of the passages cited, and different shades of meaning are indicated wherever they have been noted. The writer will be glad to receive notes of any mistakes that may be detected in the list, as it is too much to hope that none will be found in a work of this comprehensive character.

As the numbering of the chapters of Dioscorides given by Ruellius differs considerably from the numbering in Goodyer's translation and from that adopted in Sprengel's edition, an index of the corresponding numbers in these three works is supplied for purposes of cross-reference, under the initial letters R (Ruellius), G (Goodyer, ed. Gunther), S (Sprengel). The chapters in this index are arranged according to Ruellius, so that in each table the R numbers run consecutively. After each R number (or series) are placed the corresponding G and S numbers, separated by colons where they differ. Thus, in the table of "Ruellius, liber primus," the entry "RGS 1–11" means that the first 11 chapters of the first book are numbered alike in the three editions concerned. The entry "R 14, 15 : GS 13" shows that chapters 14 and 15 of Ruellius taken together correspond to chapter 13 both in Goodyer and Sprengel. The entry "R 16–19 : GS—2" indicates that the corresponding number in Goodyer and Sprengel for any of the chapters 16–19 in Ruellius may be obtained by subtracting 2 : thus R 18 corresponds to GS 16. In the table of "liber tertius," "R 88–128 : G+2 : S—8" means that 2 must be added or 8 subtracted to obtain the corresponding numbers in Goodyer or Sprengel respectively : thus R 95 is the equivalent of G 97 and S 87.

Without such a "concordance" it is sometimes difficult to find the corresponding chapters in the three editions, since different names are frequently adopted by Ruellius, Goodyer and Sprengel. Thus "Alsine," R iv. 89, G iv. 87, is the equivalent of "Myosotis," S ii. 214 partim ; and "Verbenaca" Ruellius corresponds to "Peristereon" Goodyer, and "Verbena" Sprengel.

*Ruellius, liber primus.*

RGS 1–11 ; R 12, 13 : GS 12 ; R 14, 15 : GS 13 ; R 16–19 : GS—2 ;  
R 20, 21, 22 : GS 18 ; R 23–32 : GS—4 ; R 33 : GS 29, 30 ; R 34 :  
GS 31, 32 ; R 35 : GS 33 ; R 36 : GS 34, 35, 36 ; RGS 37–39 ; R 40 :  
GS 40, 41 ; R 41 : GS 42 ; R 42 ("40") : GS 43 ; R 43–75 : GS+1 ;

R 76 : GS post 76 ; RGS 77-85 ; R 86 : GS 86, 87 ; R 87-90 : GS+1 ; R 91 : GS 92, 93 ; R 92-100 : GS+2 ; R 101, 102 : GS 103 ; R 103 : GS 104 ; R 104-106 : GS 105 ; R 107, 108 : GS 106 ; R 109-111 : GS-2 ; R 112 : G 110 : S 111 ; R 113 : G 111 : S 112 ; R 114 : G 112 : S 113 ; R 115 : G 113 : S 110 ; R 116-134 : GS-2 ; R 135, 136 : GS 133 ; R 137 : G 134 : S 140 ; R 138 : G 135 : S 134 ; R 139 : G 136 : S 135 ; R 140 (" 160 ") : G 137, 138 : S 136, 137 ; R 141 : G 139 : S 138 ; R 142 : G 140 : S 139 ; R 143-182 : GS-2 ; R 183 : GS 181, 182 ; R 184 : GS 183, 184 ; R 185 : GS 185, 186 ; R 186 : GS 187 ; R 187 : G 188 : S sub ii. 205 ; R 188 : GS iv. 73.

*Ruellius, liber secundus.*

RGS 1-49 ; R 50 : GS 51 ; R 51 : GS 50 ; RGS 52-85 ; R 86 : GS 86-94 ; R 87 (" 88 ") : GS 95 ; R 88-90 : GS+8 ; R 91 : GS 99, 100 ; R 92 : GS 101-104 ; R 93-119 : GS+12 ; R 120 : GS 132, 133 ; R 121 : GS 134, 135 ; R 122 (" 22 ") : GS 136 ; R 123-126 : GS+14 ; R 127 : GS 142 ; R 128 : GS 141 ; R 129 : G iv. 124 : S iv. 122 ; R 130-136 : GS+13 ; R 137 : G 151 : S\* ; R 138 : GS 150 ; R 139-183 : G+13 : S+12 ; R 184 : G 196 bis : S 196 ; R 185-187 : GS+12 ; R 188 : GS 201 ; R 189 : GS 200 ; R 190-192 : GS + 12 ; R 193 : G 205 : S 205 p.p. ; R 194 : GS 206 ; R 195 : GS 207 ; R 196 : G 208 ; S 208 p.p. ; R 197 : G 208 bis : S 208 p.p. ; R 198-202 : GS+11 ; R 203, 204 : GS 214 ; R 205-207 : GS+10.

*Ruellius, liber tertius.*

RGS 1-3 ; R 4 : G S 4 p.p. ; R 5 : G 5 : S 4 p.p. ; R 6-17 : G+1 : S-1 ; R 18 : G 19 : S 17 p.p. ; R 19 : G 20 : S 17 p.p. ; R 20-25 : G+1 : S-2 ; R 26 : G 27, 28 : S 24, 25 ; R 27-34 : G+2 : S-1 ; R 35 : G 37 : S 34 p.p. ; R 36 : G 38 : S 34 p.p. ; R 37 : G 39 : S 34 p.p. ; R 38 : G 40 : S 35 ; R 39 : G 41 : S 36 p.p. ; R 40 : G 42 : S 36 p.p. ; R 41-45 : G+2 : S-4 ; R 46 : G 48 : S 41 bis ; R 47-65 : G+2 : S-5 ; R 66 : G 68 (erroneously headed " Kuminon agrion ") : S 61 ; R 67 : G 69 (erroneously headed " Kuminon emeron ") : S 62 ; R 68-81 : G+2 : S-5 ; R 82 : G 84 : S 77 p.p. ; R 83 : G 85 : S 77 p.p. ; R 84 : G 86 : S 78 ; R 85 : G 87 : S 79 p.p. ; R 86 : G 88 : S 79 p.p. ; R 87 : G 89 : S 79 p.p. ; R 88-128 : G+2 : S-8 ; R 129, 130 : G 131 : S 121 ; R 131 : G 132 : S 122 (" 120 ") ; R 132-134 : G+1 : S-9 ; R 135, 136, 137 : G 136 : S 126 ; R 138-165 : G-1 : S-11 ; R 166 : G 166 : S 156 ; R 167 : G 165 : S 155 ; R 168-177 : G-1 : S-11.

*Ruellius, liber quartus.*

RGS 1 ; R 2, 3 : GS 2 ; R 4-7 : GS-1 ; R 8, 9 : GS 7 ; R 10-16 : GS-2 ; R 17 : G 15 : S 15 p.p. ; R 18 : G 15B : S 15 p.p. ; R 19-41 : GS-3 ; R 42 : GS 39, 86 ; R 43 : GS-3 ; R 89 :

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\* This chapter does not seem to occur in Sprengel's edition: it is evidently an expanded version of R. iv. 92 p.p. : G iv. 91 : S sub iv. 89.

G 87 : S ii. 214 p.p.; R 90 : G 88 : S 87 ; R 91 : G 89 : S 88 ; R 92 : G 90, 91 : S 89 ; R 93-154 : G—1 : S—3 ; R 155 : G 154 : S 152 p.p.; R 156 : G 155 p.p.; S 152 p.p.; R 157 : G 155 p.p.; S 152 p.p.; R 158-161 : G—2 : S—5 ; R 162 (cf. ii. 188) : GS ii. 201 ; R 163-167 : G—3 ; S—6 ; R 168 : G 165 (1 p.p.) : S 162 (1 p.p.) ; R 169 : G 165 (1 p.p.) : S 162 (1 p.p.) ; R 170 : G 165 (2) : S 162 (2) ; R 171 : G 165 (5) ; S 162 (3) ; R 172 : G 165 (4) : S 162 (4) ; R 173 : G 165 (3) : S 162 (5) ; R 174 : G 165 (6) : S 162 (6) ; R 175 : G 165 (7) : S 162 (7) : R 176-205 : G—10 : S—13.

*Ruellius, liber quintus.*

RGS 1-6 ; R 7 : GS 7-14 ; R 8-30 : GS+7 ; R 31 : GS 38, 39 ; R 32-67 : GS+8 ; R 68 : GS 76, 77 ; R 69-105 : GS+9 ; R 106 : G 115 : S 115 p.p.; R 107 : G 116 : S 115 p.p.; R 108-174 : G+9 : S+8.

GLOSSARY\*

*ā, āb* (*special meaning*), towards, on the side of, iii. 124 : “Folia ei sunt . . . subalbida a terra, superne virentia”, its leaves are whitish beneath, green above.

*ābtgĕre*, to drive away, iv. 182.

*abstergĕre*, to dry up, wipe off, cleanse, remove, brush off, i. 39, 56, 130, 131, 149.

*absūmĕre*, to reduce, remove, i. 2, 118 ; ii. 183, 184.

*ācerbus*, harsh, sour, iv. 105.

*ācētābŭlum*, lit. a vessel for vinegar, hence a liquid measure, about  $\frac{1}{2}$  pint, ii. 173 ; iii. 50 ; iv. 28, 67, 70, 155, 189.

*ācētum*, vinegar, i. 1, 105, 115, 178 ; v. 14.

*ācīnōsus*, berry-like, grape-like, i. 9 ; iv. 184.

*ācīnus*, lit. (1) a berry, esp. that of the grape, *Vitis vinifera*, iii. 93 ; iv. 183 ; v. 2, 3 ; hence (2) any small fleshy fruit, seed or infructescence, e.g. the berry of *Loranthus europaeus*, iii. 102 ; of *Smilax aspera*, iv. 145 ; of *Physalis Alkekengi*, iv. 75 ; of *Hedera*, ii. 199 ; the “berry” (drupe) of *Sambucus nigra* and *S. Ebulus*, iv. 185 ; the drupe of *Rhus coriaria*, i. 149, 182 ; the fleshy seed of *Punica Granatum*, i. 153 ; the berry-like female spike of *Ephedra distachya*, iv. 54.

*ācōpum*, a soothing or stimulating liniment, i. 24, 49, 64, 79, 90, 108 ; iii. 45.—“A stimulating or anodyne liniment, almost of the consistence of an ointment,” Wootton, ii. 279.

*ācor*, lit. a sour taste, sourness, hence (1) sourness of smell, i. 21 ; (2) sourness due to putrefaction, i. 157, 162 ; ii. 111 ; (3) sourness of the stomach, v. 5.

*ācŭlēātus*, (1) spiny, prickly, i. 123 ; ii. 192 ; iii. 12 ; iv. 145 ; (2) stinging, ii. 131.

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\* The numbers refer to the book and chapter in Dioscorides, ed. Ruellius: thus “iii. 124” means Book 3, Chapter 124.

- dcūlēus*, a spine, i. 121.
- ddeps*, lard, suet, soft animal fat, i. 181, 184 ; ii. 86 ; iii. 5 ; iv. 44.
- adhībēre*, to use, apply, i. 118.
- adīmēre*, to remove, i. 5 ; iii. 5.
- admnīcūlum*, a support, iv. 16, 195.
- admōtus*, applied (to), i. 1, 63, 140.
- adnascens*, growing on, i.e. lateral, ii. 173 : " sesquipedali cauliculo, tenui, non sine adnascentibus ramis."
- adnātum*, a lateral or subsidiary shoot, iii. 7, 78 ; iv. 29.
- adnātus*, lit. growing on, hence lateral, iv. 65.
- ādōlescēre*, to grow up, grow, iv. 63 : " Palmi altitudine et interdum amplius adolescit."
- aduncus*, hooked, curved into a hook, ii. 192 : " Spinas ut rubus habet, in hami modum aduncas."
- adversāri*, (1) to be bad for, i. 40, 90, 106, 141, 160 : " Siliquae recentes stomacho adversantur " ; (2) to counteract, i. 123 : " Serpentium ictibus adversatur."
- adversus*, against, i.e. as a remedy for, i. 50, 57 ; ii. 112 ; iv. 1, 74 : " Valet succus eius adversus ignem sacrum."
- aedēre*, to put forth, iii. 44, 116, 121 bis ; iv. 82, 125 : " Caulem aedit quadrangulum, digiti longitudine."
- aegrē*, with difficulty, i. 1 ; iv. 65 : " Aegre propter duriciam tunditur."
- aestūāre*, to burn (esp. of the stomach), i. 162 : " Cruda [cotonea] cataplasmatibus adiiciuntur, ad cohibendam alvum, aut si stomachus aestuet " ; ii. 146 ; iii. 6 ; iv. 74, 123.
- aestūāto*, (1) a burning fever, i. 151 ; (2) a burning pain, ii. 138 : " Stomachi et intestinorum aestuationem, fluctionesque mulcet."
- aestus*, midday heat, iv. 146 : " Hac smilace quadam topiariorum arte, tentoria contra aestus molestiam factitantur."
- afferre*, (1) to bring, import, iii. 2 : " Provenit in iis quae supra bosphorum sunt regionibus, ex quibus affertur " ; hence (2) to cause, produce, i. 150 : " Capitis dolorem afferunt."
- affūsus*, poured on, i. 140.
- agnātum*, a lateral shoot or branch, hence a pedicel of a corymb, ii. 161.
- agnātus*, lit. growing on, hence lateral, i. 31 ; ii. 126 ; iii. 53.
- agrestis*, wild, uncultivated, i. 143.
- āla*, lit. a wing, hence (1) an armpit, i. 157 ; (2) an axil, iii. 85 ; 109, 155 ; iv. 74, 106, 139 ; (3) an axillary branch, ii. 207 ; iii. 128 ; (4) a peduncle, iii. 130 ; (5) ray of inflorescence of *Euphorbia Lathyris*, iv. 177 ; (6) ochrea of *Polygonum Hydropiper*, ii. 178.
- ālārū sinus*, an axil, angle between stem and leaf, ii. 204 ; iii. 12.
- albīcāre*, to be white, ii. 173 : " Flos albicat."
- albūgo*, a white spot on the eye, i. 143.
- ālēre*, to feed, nourish, ii. 95, 121, 122, 127.
- allīcēre (somnia)*, to induce (sleep), i. 63 ; to attract, iv. 114 :

“Nonnulli quod apes alliciat, prope alvearia serunt.”

*alvēārĭum*, a beehive, iv. 114.

*alvus*, bowels, i. 135: “Citam alvum supprimit aut potus aut inditus”; i. 160: “Alvum solvunt.”

*ambĭtus*, (1) circumference, outline, iii. 71: “folia ex intervallis habet divisa in ambitu”; iii. 123, 155: “floribus . . . forinsecus orbiculato ambitu”; iv. 1; (2) margin, edge, i. 149; iv. 185: “foliis . . . in ambitu serratis”; (3) *per ambĭtum*, towards the circumference, outside, iii. 156: “flore per ambitum albo, intus melino.”

*ambustum*, a burn, i. 81, 109, 126; ii. 199; iv. 164.

*āmurca*, the lees or dregs of olive oil, i. 134, 137.

*ānhēlātor*, a gasping or asthmatic person, i. 184.

*antĕrior* (*pars fōlii*), ventral or upper (surface of a leaf), iii. 120: “folia . . . quae parte anteriore laevia cernuntur, a tergo autem pensiles quasi vermiculos ostendunt.”

*anthĕra*, a medicine composed of flowers, i. 132: “Misceri solent . . . compositionibus quas antheras vocant.”

*antĭquus*, of long standing, chronic, iv. 105: “Decoctum . . . antiquae tussi auxiliatur.”

*appendĭcŭla rāmŭlārĭs*, petiole of a palmate or trifoliate leaf, iii. 121: “Frutex . . . virgas habens . . . e quibus enascuntur appendiculæ, quae in terna singulis germinationibus exeunt folia.”

*āqua caelestis*, rainwater, i. 61, 64, 153, 157.

*āqua mulsa*, hydromel, honey-water, i. 122, 181; iv. 186.

*arbuscŭla*, a small tree, shrub, i. 149.

*arcĕre*, to hinder, prevent, i. 34.

*ardor*, a burning or intense pain, v. 1.

*ārescĕre*, to become dry, iv. 151.

*āridus*, dry, withered, i. 186.

*ārista*, an awn, iv. 140.

*arquātus*, having jaundice, iv. 144.

*artĕria*, the wind-pipe, i. 125, 184; ii. 166; iii. 6; iv. 68, 182 bis.

*articŭlus*, (1) a joint of the body, i. 3; iv. 73; (2) a node of a rhizome of *Agropyrum repens*, iv. 33; (3) a node of an aerial stem of *Rubia tinctorum*, iii. 161.

*artus*, a joint of the body, i. 135, 152, 157.

*arvum*, a ploughed field, arable land, iv. 71.

*aspārāgus*, a tender young shoot or sprout of *Brassica Rapa*, ii. 121; of *Bryonia dioica*, iv. 194.

*asper*, rough, rough-haired, e.g. the leaves of *Inula Helenium*, i. 31, and the stem of *Papaver dubium*, iv. 67.

*asservāre*, to preserve, keep good, i. 59; iv. 139.

*assŭla*, a chip, splinter, i. 131.

*assŭlātĭm*, in chips, splinters, bits, pieces, i. 34.

*assŭmĕre*, (1) to take (an amount or quantity), i. 61, 64; (2) to take (as a medicine or food), i. 178; ii. 119.

*ātrāmentum*, a black pigment: *ātrāmentum librārĭum* seu *scrip-tōrĭum*, a black pigment for making ink, i. 86, 91; iii. 25; v. 174;

*atrāmentum sūtōrtum*, shoemaker's blacking, i. 86, 184 ; iii. 10, 93 ; v. 174.

*auriculā*, the external ear, iii. 28.

*āversus*, lit. turned away, hence (of leaves), on the back, beneath, iv. 142 : "foliis . . . quae superne virent, aversaque candidiora spectantur."

*axungla*, grease, fat, i. 145, 181, 187 ; ii. 3, 90, 196.

*bacca*, a small or medium-sized fleshy fruit : (1) the berry of *Myrtus*, i. 157 ; *Cornus*, i. 174 ; *Ruscus*, iv. 147 ; *Laurus*, i. 108 ; (2) the drupe of *Prunus spinosa*, i. 176 ; *Pyracantha*, i. 124 ; *Zizyphus* and *Celtis*, i. 173 ; (3) the false berry of *Juniperus*, i. 101, 104.

*bālānīnus*, prepared from the fruit of *Balanites aegyptiaca* : e.g. *bālānīnum ōlēm*, i. 40, 61, 71, 74 ; *bālānīnum unguentum*, i. 24.

*bālānus*, lit. an acorn, hence a suppository, ii. 168 ; iv. 79, 151, 188.

*bālaustium*, the flower of the wild pomegranate, i. 156.

*brēvis*, lit. short, hence (of a tree) low, ii. 176.

*bulbācēus*, bulbous, iv. 66.

*bulbōsus*, (1) bulbous, ii. 161 ; (2) tuberous, iii. 142, 144.

*bulbus*, a bulbous plant, esp. *Muscari comosum*, iv. 66.

*bulbus cibārius*, purse-tassels, *Muscari comosum*, ii. 189.

*bulbus vōmītōrius*, a bulbous plant possessing emetic properties, possibly a *Narcissus* or *Ornithogalum*, ii. 188.

*bullā*, a blister-like swelling, iii. 12.

*caera*, wax, i. 39 ; ii. 93 ; iv. 26, 169.

*caerātum*, a wax ointment, i. 22, 39, 70, 86, 92, 150 ; iv. 97. "Cerates were ointments made solid by wax, but not so hard as plasters," Wootton, ii. 283.

*cālūmūlus*, a little piece of cane used for brushing the teeth, i. 88 : "Virentes surculi calamulorum vice dentibus repurgandis affricantur."

*cālāmus*, lit. a reed or cane, hence a stem resembling one, iv. 3, 55.

*cālāmus ōdōrātus*, geranium grass, *Cymbopogon Martini* (*Andropogon calamus-aromaticus*), according to Royle, Ill. 425.

*cālāthus*, a vase-shaped basket, iv. 182 : "flores . . . in calathi modum cavo."

*calfactorius*, warming, heating, i. 2 : "Radici vis calfactoria."

*cālīgo*, a film causing dimness or obscurity of vision, i. 2, 15 : "Caliginem pupillis oculorum obversantem discutit."

*cālīx*, a cup, i. 118 : "Potioris calices e caudice lienosis moliuntur, quo datus in his potus proficiat."

*cālīx* (for *cālyx*) *pūnici*, the rind of the pomegranate fruit, i. 139.

*calliblēphārum*, a dye for the eyelashes and eyebrows, i. 86, 151.

*cālyculātus*, (1) involucrate, ii. 121 : "fert . . . fructum in siliquis calyculatis" ; (2) (for *cāliculātus*), cup-shaped, iv. 169 : "in cacuminibus caulium . . . calyculati folliculi, aliquantum cavi, in quibus semen continetur," at the apices of the stems are cup-shaped



little sacs [cyathia], considerably hollowed out, in which the fruit is contained.

*cālycūlus*, a small pod or capsule : (1) the legume of *Trigonella Foenum-graecum*, iv. 69 ; (2) the siliqua of *Hypericum*, iii. 174.

*cālyx*, lit. a covering, hence : (1) the involucre of *Tragopogon*, ii. 160 ; (2) the exocarp of *Juglans regia*, i. 180 ; (3) the capsule of *Gentiana*, iii. 3 ; the capsule of *Papaver*, iv. 67, 68.

*campestris*, plains, flat open country, iv. 99, 105, 129.

*cānicles*, grey hair, i. 34.

*cānus*, white, grey, hoary, iii. 38.

*cāpillāmentum*, lit. the hair, hence a slender rootlet, i. 10 ; ii. 194, 195, 200 ; iv. 13, 196.

*cāpitūlum*, lit. a small head, hence : (1) a tuber of *Pedicularis tuberosa*, iii. 134 ; (2) the capitulum of *Compositae*, ii. 179 ; iii. 13, 70, 106 ; iv. 121 ; (3) the capitate inflorescence and infructescence of *Sanguisorba officinalis*, iv. 37 ; of *Plantago Psyllium*, iv. 73 ; (4) the pseudocapitate inflorescence of *Dipsacus*, iii. 12 ; of *Eryngium*, iii. 23 ; of *Coridothymus capitatus*, iii. 42 ; (5) an umbel, iii. 59, 60, 67, 74 ; (6) the short dense raceme of *Coris monspeliensis*, iv. 11 ; (7) the cyathium of *Euphorbia*, iv. 172 ; (8) the head-like androecium of *Anemone coronaria* and *A. stellata*, ii. 195 ; of *Nigella sativa*, iii. 92 ; of *Peganum Harmala*, iii. 51 ; (9) the capsule of *Papaver*, ii. 195 ; iii. 46 ; iv. 68 ; (10) the lomentum of *Ornithopus* or *Scorpiurus*, iv. 135.

*cāprēolus*, *cāpriolus* (1) a tendril, ii. 182 ; iv. 195 ; v. 1 ; (2) a twining shoot of *Vigna unguiculata*, ii. 163.

*cāpūs*, (1) lit. the head of an animal, iv. 30, or of a human being iii. 63 ; hence (2) the crown of the root, iv. 29 ; (3) the basal bulb-like thickening of the stem of *Veratrum album*, iv. 151 ; (4) the capitulum of *Centaurea*, iii. 7 ; of *Scolymus*, iii. 15 ; (5) an umbel, iii. 77, 81 ; (6) the pleiochasium of *Euphorbia*, iv. 171, 172 ; (7) the receptacle (torus) of *Rosa*, i. 132 ; the receptacle (gynophore) of *Nelumbo*, iv. 115 ; (8) the capsule of *Papaver*, ii. 196 ; iv. 67, 68.

*cāriōta*, a kind of date, i. 150.

*cāro*, (1) lit. the flesh of animals or man, i. 77 ; ii. 115, 121 ; hence (2) the fleshy endosperm of *Ricinus*, i. 38 ; (3) the fleshy cotyledons of *Castanea*, i. 147.

*cātāplasma*, a poultice or plaster, i. 29, 152 ; iv. 72.—“ Used originally for both poultices and plasters. Cataplasmata were perfumed powders sprinkled over the clothes, or sometimes depilatories,” Wootton, ii. 283.

*cātāpōtium*, a pill, i. 99, 134 ; iv. 156, 169, 188.

*caudex*, the trunk of a tree or arborescent shrub, i. 114, 183 ; iv. 167, 198.

*caulicūlus*, lit. a small stem : (1) a small main or solitary stem, i. 7 ; ii. 156, 159, 173 ; iii. 56 ; iv. 93, 121 ; (2) a young shoot, ii. 133, 139 ; (3) one of several stems from the root, ii. 137 ; iii. 51 ; iv. 30 ; (4) the scape of *Ornithogalum*, ii. 161 ; (5) the peduncle of *Viola odorata*, iv. 123 ; (6) the rhachis of the leaf of *Adiantum*, iv. 137.

*caulis*, (1) a stem in general, i. 182 ; (2) a solitary or main stem, i. 1, 31 ; ii. 126, 129, 178 ; iv. 99 ; (3) one of several stems from a root, ii. 204 ; iii. 116 ; (4) the scape of *Cyclamen*, ii. 181 : " Folia habet haederae . . . caule nudo, quaternos digitos aequante."

*cavus*, hollow, i. 10 ; iii. 76.

*cērsa*, white lead, ii. 140 ; v. 94 ; vi. 22.

*cēspes*, lit. a turf, sod, hence earth, ground, i. 2 : " habet . . . radices . . . summo cespis sparsas."

*cēre*, to excite, stimulate, produce, cause, iv. 114 ; v. 5.

*cimōlia*, Cimolian earth, a white clay from Cimolus in the Cyclades, ii. 140.

*circumfractus*, reflexed, iii. 78.

*cītus*, loosened, in motion, i. 135 ; iv. 68.

*clāvīcula*, a tendril, iv. 194 ; v. 2.

*clāvus*, lit. a nail, hence a corn, i. 139 : " Corticis cinis admisto aceto illitus, clavos et callos tollit."

*cochlēa*, a snail, i. 77.

*cochlēar*, lit. a spoon, hence a spoonful, ii. 190 ; iv. 182.

*cochlēaris mensūra*, a spoonful, ii. 95, 180.

*coctio*, cooking, i. 3.

*coelestis aqua*, rain-water, i. 61, 64, 153, 157.

*coeliācus*, afflicted with a disease of the bowels, i. 140, 144, 149.

*cōgere*, (1) to mix, combine, i. 67 ; (2) to compress, make up, i. 6, 135, 140, 158, 183 ; iv. 200 ; (3) to thicken, condense, iv. 2 ; v. 6.

*cognītus*, well-known, iii. 39 : " Cognita haerba est."

*cōhibēre*, to check, restrain, stop, i. 23, 29, 33, 117, 135, 162.

*cōlāre*, to strain, filter, i. 58, 61, 64.

*collectio*, lit. a collecting together, hence a swelling, tumour, abscess, i. 29, 61.

*collūere*, (1) to wash out, rinse, i. 23, 25, 52, 77, 141 ; (2) to use as a mouth-wash, i. 142.

*collūto*, a rinsing, washing, i. 88, 118 ; iii. 10.

*collyrium*, (1) an eye-salve, i. 131, 140 ; ii. 140 ; (2) a pessary, ii. 183, 184 ; iii. 3.

*colum*, a strainer, colander, i. 61.

*cōlymbās (ōlīva)*, an olive prepared in brine, i. 141.

*cōma*, lit. the hair of the head, a head of hair, hence : (1) foliage, i. 20, 119 ; ii. 166 ; iii. 79 ; iv. 39 ; (2) crown of foliage, iii. 29, 90 ; iv. 133, 174 ; (3) tuft of leaflike branchlets of *Equisetum*, iv. 49, 50 ; (4) crown of inflorescence, iv. 58, 60, 66, 73 ; (5) crown of infructescence, iv. 82.

*cōmittālis*, an epileptic, i. 5, 27, 184 ; iv. 70.

*commandūcare*, to chew, masticate, i. 140 ; iv. 158 ; v. 4.

*commendāre*, lit. to entrust, commit or commend to, hence : (1) to make agreeable, sweeten, i. 25, 89 ; (2) to set off with advantage, i. 35.

*comminūere*, to separate or break into small pieces, i. 5 ; ii. 126 : " Calculos vesicae comminuunt."

*committĕre*, to bring together, close up, i. 135, 152 : "Laxatos artus committit."

*compāges*, structure, composition, i. 118 : "arbor . . . fructum quasi florem ferens compage muscosum."

*compescĕre*, to repress, check, ii. 152 : "Epotum semen, assiduas libidinum imaginationes in somno, compescit."

*compōs*, possessed of, i. 72.

*compōsitiō*, lit. (1) the compounding, preparation, i. 55, 58-64, 66 ; hence (2) a preparation, 1. 28 : "Cyphi thymiamatis compositio est, dicata diis, qua abunde aegyptii sacerdotes utuntur."

*concha*, lit. a mussel, hence a mussel-shell, hence a small vessel, spoon or ladle for holding or scooping up oil, i. 34, 38, 39, 48 ; iv. 182 : "radix in testudinis speciem excavatur, quo fit ut in cavum confluat succus, qui conchis demum excipitur."

*conciliāre* (*somnum*), to cause, bring about (sleep), i. 1 ; v. 7.

*concoep̄tācūlum*, lit. receptacle, applied to : (1) the calyx of *Salvia Aethiopis*, iv. 106 ; (2) the capsule of *Euphorbia Lathyris*, iv. 177.

*concōquĕre*, (of an ulcer or abscess), to mature, bring to a head, i. 22, 30, 56.

*condĕre*, to preserve, pickle, v. 3.

*condĕmentum*, seasoning, iii. 39, 42 : "Perquam utile pro condimento, dumtaxat ad usus eorum, qui recte valent."

*condĕre*, to preserve, pickle, i. 160, 162, 174 ; ii. 154, 168, 177, 185 ; iv. 9, 179 ; v. 3 : "Sapa aut musto conditae, stomachum magis infestant."

*conferre*, to be good for, i. 16, 33 ; ii. 115 : "Tussi confert."

*conḡtus*, a liquid measure of six sextarii (nearly 6 pints), i. 91.

*constāre*, (1) to remain constant, hence (with abl.), constantly to be provided with or possess, i. 1, 107 : "Laurus quaedam tenui folio constat" ; i. 121 : "Tertium nigrioribus latioribusque foliis constat" ; ii. 194 ; iv. 29 ; (2) to consist of, be composed of (with abl.), i. 70, 71 : "Mendesium constat balanino oleo, myrrha, casa et resina" ; iv. 150 ; (3) *constat*, it is established or well known, i. 16.

*contĭnĕre*, (1) to keep, hold, retain, i. 33 : "Dentes firmat si contineatur in ore" ; (2) to check, stop, i. 130 : "Capillum fluentem continet, addito vino myrrha aut myrteo oleo."

*contūsus*, bruised, crushed, i. 47 ; iv. 72.

*convĕnĭre*, (1) to be adapted to, be serviceable for, i. 23, 24 ; iv. 68 ; v. 6 ; (2) to suit, be good for, i. 16, 141.

*convolvĕre*, to twine round, iv. 145 : "Arbores scandit, se convolvens eis."

*cōquĕre*, to boil, i. 134.

*cōrolla*, a garland, i. 34 ; iii. 113.

*cōrōnāmentum*, a garland, i. 9.

*cōrōnārĭus*, a garland-maker, iv. 75 : "Quo coronarii utuntur, et corollas factitant."

*cortex*, bark, rind, shell, husk : (1) bark, i. 12, 32, 111, 182 ; iv. 79 ; *summus cortex*, the outer bark, i. 183 ; (2) the outer layer of a  
158

corm, ii. 184 ; (3) pericarp of *Castanea*, i. 147 ; of *Nelumbo*, ii. 116 ; (4) testa of *Ricinus*, i. 38 ; of *Faba*, ii. 115 : " Faba dempto cortice in illas parteis divisa, in quas suapte natura scinditur, imponi solet " ; of *Lens*, ii. 117 ; of *Ervum*, ii. 119.

*cōrymbus*, (1) a cluster of flowers or fruits, iv. 10, 58; (2) the umbel of flowers or fruits of *Hedera*, ii. 199 ; iv. 165 ; of *Smyrnum*, iii. 76 ; (3) the spike-like inflorescence of *Origanum*, iii. 31 ; (4) a corymb of capitula, iii. 27 ; (5) a berry of *Withania*, iv. 76 ; of *Solanum*, iv. 77.

*cōs*, a grindstone, i. 131.

*cōtīcūla* (dim. of *cōs*), a small mortar, i. 131.

*cōtōnēum* (sc. *mālum*), a quince fruit, i. 162.

*coxendix*, the hip, i. 9 ; iii. 2, 27 ; iv. 10.

*crassāmentum*, sediment, grounds, i. 79.

*crēmor*, thick juice or extract, cream, i. 77 ; iv. 151.

*crībrāre*, to sieve, sift, i. 28, 61, 83 ; ii. 196 ; iv. 156.

*crībrum*, a sieve, ii. 119 ; iv. 156.

*crōcātus*, saffron-yellow, iv. 76.

*crōcīnus*, saffron-yellow, i. 134.

*crōcum*, saffron, i. 29 ; v. 5.

*crōcus*, a stamen of *Nymphaea*, iii. 149.

*crūdītās*, (1) indigestion, i. 22 : " Ex aqua potum cruditatibus, torminosis, vulsis, venenatorum ictibus opitulatur ; (2) undigested food, i. 37 : " Bilem cruditates detrahit, sextario cum una aquae hemina dato."

*crūdus*, (1) lit. raw, uncooked, i. 134, 145, 162, 184, 185 ; ii. 131, 132 ; (2) unbaked, i. 81 : " Alii crudo fictili luto oblito, et in furnum indito, cremant " ; i. 140 : " In cruda olla oblito ore luto. . . uruntur " ; (3) immature, not ripe, i. 22 : " Ulcera sordida expurgat, et cruda concoquit."

*crūentus*, stained with blood, i. 31 : " Trita potaque ad cruentas excreationes efficax est."

*cūbītālis*, a cubit long, i.e.  $17\frac{1}{2}$  inches, i. 4, 10 ; iii. 54 ; iv. 10, 25.

*cūbītum*, an ell, cubit, i.e.  $17\frac{1}{2}$  inches, i. 3, 121, 134, 149 ; ii. 174 ; iv. 7.

*cyāthus*, lit. a ladle for transferring wine to the drinking-cup, hence a liquid measure of about  $\frac{1}{4}$  pint, i. 87, 92, 105, 134, 182 ; ii. 140 ; iii. 140 ; iv. 45, 79, 156.

*cyma*, tender young sprout of *Brassica*, ii. 133, 134.

*cytīnus*, (1) the flower of the cultivated pomegranate, i. 154, 155, 156 ; iv. 72 ; (2) transf. to the calyx of *Hyoscyamus reticulatus*, iv. 72.—The Greek word κύτινος was used for the flower of the pomegranate in allusion to the urn-like shape (κύτος, a jar, urn) of the calyx. The calyx of the pomegranate, being *coloured*, was reckoned as part of the flower. See Theophrastus, Enquiry into Plants, transl. Hort. i. 94, footnote 4.

*dēcidūus*, falling off, deciduous, iv. 146 : " Folia per autumnum decidua " ; *prōtīnus dēcidūus*, caducous, iv. 67 : " Papaver erraticum,

quod Rheean vocant . . . flore protinus deciduo, unde et nomen apud Graecos accoepit."

*dēcoctum*, a boiled preparation, decoction, i. 7, 31 ; iv. 68.

*dēcoctus*, boiled, cooked, i. 31 ; ii. 131, 184, 190.

*dēcōquēre*, to boil, iv. 68.

*dēflūēre*, (1) to flow down slowly, i. 77 ; (2) to fall off gradually, i. 34.

*dēflūvium*, falling off gradually, i. 151 ; ii. 172 : " Capillorum defluvia cohibet."

*dēlibrāre*, to strip of rind or bark, to shell, iv. 79 : " Delibratur radix, et traiectus lino cortex, ad usum suspenditur " ; iv. 87, 200 : " amygdalorum tostorum et delibratorum cyathi tres."

*dēligēre*, to choose, select, i. 16.

*dēlinctus*, an electuary, looch, linctus, ii. 166, 175, 190 ; iv. 86.

*dēlingēre*, to lick up, take as a looch, ii. 183.

*dēmētēre*, to gather, harvest, ii. 187.

*densus* (1) lit. thick, dense, i. 134 ; hence (2) hoarse : " Et densam vocem expedit."

*dēpascens*, rodent, i. 141 ; iii. 3.

*dērādēre*, lit. to scrape off, hence to skim off, i. 47 ; " Innatans oleum deraditur."

*dēstillātio*, *distillātio*, catarrh, i. 77, 99 ; ii. 183 ; iii. 28.

*dētergēre*, to cleanse off, remove, i. 15 : " Lentigines et vitia cutis in facie ex melle illitum detergit."

*dēvōrāre*, to swallow, take as a medicine, i. 134 ; ii. 190 ; iv. 1.

*diffērentia*, lit. a difference, hence a different kind, species, iv. 72.

*dīgērēre*, (1) to divide up, make up, i. 7, 64, 133, 140 ; ii. 191 ; hence (2) to dissolve, dissipate, i. 1 : " humorum qui aegre reliiciuntur crassitiem digerunt."

*dīgītālī crassitūdīne*, measuring a finger's breadth, i.e. about  $\frac{1}{4}$  in., iii. 81.

*dīgītālī longitūdīne*, measuring a finger's length, i.e. about 3 inches, ii. 173.

*dīgītus*, lit. a finger, hence a finger's length (about 3 inches) or breadth (about  $\frac{1}{4}$  inch), iii. 148 ; iv. 7, 84.

*discūtēre*, lit. to shatter, hence to disperse, dispel, i. 2, 3, 15, 184 ; iv. 112.

*dissectus*, lit. cut into pieces, hence (1) split, iv. 98 ; (2) cut, incised, ii. 146.

*dōdrans*, a measure of 9 inches, iv. 142, 164.

*dōdrantālis*, nine inches long, ii. 156, 185 ; iii. 5, 10 ; iv. 170, 172.

*dōlūm*, a wide-mouthed globular jar, i. 81.

*dūricia*, an induration, i. 1, 184.

*eclēgma*, an electuary, thick syrup, looch, linctus, i. 3, 31, 90, 92, 108, 178.—" Thick syrups given on a piece of liquorice root to suck with the object of relieving coughs", Wootton, ii. 288.

*effundēre*, lit. (1) to pour away, ii. 117 ; hence (2) to relax, loosen, i. 107 : " Sed pota stomachum effundunt, et vomitiones movent "

(possibly a mistake for *offendunt*, trouble, disagree with—see Spreng. Diosc. i. 107, adnot. 55).

*ēlēphantīcus*, a leper, ii. 140 ; iii. 41.

*ēligere*, to choose, select, i. 5, 12, 57, 64, 135 ; iv. 152 ; v. 6.

*ēllychnium*, a lamp-wick, i. 94.

*ēlōtus*, washed clean, ii. 183.

*ēlūēre*, to wash, cleanse, i. 6.

*ēmarcescere*, to wither, decay, ii. 184.

*ēmendāre*, lit. to correct, improve, amend, hence (of faults or blemishes) to remove, i. 27, 56 : " Vicia cutis in facie emendat."

*ēmicāre*, to spring forth, spring up, grow, i. 9 ; ii. 126 : " semine . . . in caule, et agnatis appendicibus, emicante " ; iii. 120 : " In umbrosis, et opacis hortorum ambulationibus emicat " ; iii. 140 : " multis calamis ex una radice emicantibus " ; iv. 92, 124.

*ēmollīre*, to soften, soothe, act as an emollient, i. 1, 41 ; iv. 130.

*emplastrum*, a plaster, i. 38 ; iii. 53.

*ēpulāri*, to feast, banquet, i. 76 : " Apud persas inter epulandum usurpatur odoris causa."

*ērūēre*, to dig up, uproot, iii. 121 : " Radice parva, tenui, haer-bacei coloris, dum a terra eruitur."

*ērūgāre*, to smoothe, remove wrinkles from, i. 39 ; iv. 124 : " faciem erugant, et cutem extendunt."

*ex* (special meaning), mixed with, prepared with, i. 1, 140, 178 ; ii. 175 ; iii. 175 : " Contra Phalangiorum morsus ex vino potum auxilio est. Rigoribus ex pipere, opisthotonicis ex oleo, aptissimo illinitur " ; iv. 1.

*excalfācere*, to warm, heat, burn, i. 3 : " radicibus . . . linguam excalfacientibus " ; i. 15, 31 : " In summa excalfaciens " ; iv. 125.

*excalfactōrius*, warming, heating, i. 1 : " Vis omnibus excalfactoria."

*excernēre*, to expel, discharge, ii. 141 : " Quae cruda coctaque esu, calculos rumpunt atque excernunt."

*excipēre*, lit. to take out, hence (1) to catch, i. 81, 183 : " Spongia aut vellere lachryma excipitur " ; (2) to take with, mix with, i. 15, 109 : " Exceptae autem adipe igni ambusta sanant."

*excōlāre*, to strain, i. 40, 54 : " mox in vas oris patuli excolatur."

*excūtēre*, to shake off, remove, i. 6 : " Intueri autem oportet si lutum radicibus insideat, et incerniculo pulverem excutere."

*exiccāre*, to dry, i. 6 ; ii. 116 ; iv. 72, 115.

*exiguus*, (1) little, small, insignificant, ii. 175, 194 ; iii. 62 ; iv. 104, 135 ; (2) in small quantity, ii. 113 ; " semen . . . cum melle, oleo, exiguaeque aqua decoctum."

*exilis*, (1) thin, slender, iv. 10, 30 ; (2) small, iv. 71, 92.

*extimēre*, (1) to take out, i. 62, 64 ; (2) to remove, extract, i. 101, 183 ; ii. 111, 113, 194 ; (3) to skim off, i. 47, 134.

*exortus*, lit. a coming forth, hence (1) *exortus (folii)* the place of origin or insertion (of a leaf), iv. 7 : " Flores per singulos foliorum exortus promit " ; (2) an outgrowth, division or pinna of a leaf, iv.

104 : "Foliis avicularum pennas imitantibus, brevi admodum dissectoque foliorum exortu."

*expētēre*, to seek after, i. 63 : "Optimum est quod abunde crocum spirat, in medendi usu expetitur."

*expōlire*, to smooth, i. 77 : "Subdita linguae liquataque, scabriem arteriae expolit."

*expurgāre*, to remove by cleansing, iv. 113.

*extendēre*, to stretch out, smooth out, iv. 124.

*extēnuāre*, (1) to make thinner or more liquid, i. 1, 74 : "Humorem extenuat"; (2) to reduce, diminish, ii. 112, 123 : "Lienem extenuat."

*exūere*, to throw off, ii. 116 ; iv. 77.

*faex*, lees, dregs, ii. 187.

*farctus*, (1) congested, i. 3 ; (2) stuffed, iv. 49 : "Cauliculi prodeunt inanes, geniculati, in se farcti."

*fastidium*, nausea, squeamishness, distaste for food, ii. 120, 126 ; v. 5 : "Contra fastidia et acorem stomachi, sicca et illita efficax est."

*fauces*, the upper part of the throat, ii. 111 ; iv. 11 : "Faucibus asperis subvenit."

*fel*, gall, i. 7 : "Inflammationibus iocineris, et felle suffusis auxiliatur"; iv. 156.

*fervēfacēre*, to boil, i. 3 ; iv. 86, 179.

*fervor*, burning heat, high temperature, i. 25.

*fictile* (sc. *vās*), an earthenware vessel, i. 34, 81, 135 ; iv. 79.

*fictilis*, made of earthenware, iv. 1.

*fīcūs* (pl.) the piles, ii. 189.

*fīnum*, dung, ii. 90, 185 ; iv. 86.

*findēre*, to divide, ii. 143 : "Folia . . . adulta eruae modo finduntur."

*fīnīre*, lit. to limit, bound, hence (1) to keep in, retain, iv. 152 : "Item contra gravitatem auditus in aurem demittitur, ibique in alterum aut etiam tertium diem finitur"; (2) to restrain, check, stop, i. 130, 149, 178 ; iv. 3, 63.

*fistūla*, ulcer, fistula, i. 1 : "Fistulas et sinus carne explet."

*fistulōsus*, hollow, fistular, i. 12 ; ii. 159.

*floccus*, *flōcus*, (1) a piece of wool or down, i. 125 ; iv. 85 ; (2) wool or tomentum, iv. 132 ; (3) a pappus hair, iii. 7.

*flōcūlus*, a little piece of wool or down, i. 125.

*flos*, lit. a flower, actually the coloured (i.e. not green) parts of a flower or inflorescence : usually (1) the corolla, e.g. of *Cistus*, i. 128 ; *Papaver*, iv. 67 ; *Glaucium*, iv. 69 ; *Galium Aparine*, iii. 103 ; *Anagallis*, ii. 198 ; *Scrophularia*, iv. 96 ; *Teucrium*, iii. 111 ; (2) the perianth of a petaloid Monocotyledon, e.g. of *Iris*, i. 1 ; of *Ornithogalum*, ii. 161 ; (3) the coloured calyx and corolla of *Punica Granatum*, i. 154 ; (4) the coloured calyx of *Anemone*, ii. 195 ; the purplish calyx of *Asarum*, i. 9 ; (5) the yellow anthers (and stigmas) of *Rosa*, considered as forming a second flower in the middle of the corolla (*rosa*), i. 132 : "Flos qui in mediis rosis invenitur, siccatus, gingivarum fluctionibus efficaciter inspergitur"; (6) the anthers

of an inflorescence of *Plantago*, ii. 140 ; (7) the florets of a capitulum of Compositae, iii. 7, 71, 106 ; (8) the scorpioid cymes of *Heliotropium*, iv. 203.

*flosculus*, a little flower, ii. 129 ; iv. 123.

*fluxio* (*fluxio*), a flux, i. 3, 132, 144, 182.

*fluere*, lit. to flow, hence to fall off gradually, i. 130, 157 ; ii. 133 : "Fluentes capillos retinent."

*fodere*, to dig up, i. 31 : "Foditur aestate radix."

*foenicus* (for *phoeniceus*), purple-red, ii. 198.

*folliculus*—see *folliculus*.

*foliolum*, (1) a small leaf (? or leaf segment), ii. 129 ; (2) a bract, iii. 18.

*folium*, lit. a leaf, but applied also to leaflets, bracts, petals etc. : (1) a leaf (lamina) e.g. of *Malva*, ii. 131 ; *Beta*, ii. 136 ; *Polygonum*, ii. 178 ; *Gentiana*, iii. 3 ; *Eryngium*, iii. 23 ; *Thymus*, iii. 42 ; (2) a leaflet, e.g. of *Rhus coriaria*, i. 149 ; *Ervum Ervilia*, ii. 119 ; *Glycyrrhiza glabra*, ii. 6 ; *Psoralea bituminosa*, iii. 121 bis ; *Adiantum*, iv. 138 ; *Sambucus*, iv. 184 ; (3) a bract of *Echium*, iv. 30 ; (4) a petal of *Rosa*, i. 132 ; (5) a leaf-like branchlet of *Equisetum*, iv. 49.

*folliculus*, lit. (1) a small bag or bladder, i. 121 ; hence (2) a bladder-like gall of *Ulmus*, i. 113 ; (3) the cyathium of *Euphorbia*, iv. 169 ; (4) the bladder-like calyx of *Physalis Alkekengi*, i. 188 ; iv. 75 ; (5) a socket in the receptacle (gynophore) of *Nelumbo nucifera*, in which an individual fruit is inserted, ii. 116 ; (6) a legume, e.g. of *Acacia*, i. 135 ; *Cicer*, iv. 158 ; *Vigna unguiculata* and *Spartium junceum*, iv. 160 ; (7) the follicle of *Aconitum*, iv. 81 ; *Delphinium*, iv. 158 ; (8) the capsule of *Iris foetidissima*, iv. 25 ; (9) the indehiscent fruit of *Isatis tinctoria*, ii. 206.

*forcipula*, a forceps, i. 84.

*fotus*, a fomentation, i. 4, 184.

*fovere*, to foment, i. 113 ; ii. 112 ; iv. 107.

*frondosus*, leafy, i. 183.

*frons* (gen. *frondis*), lit. (1) a leafy branch, ii. 116 : "Folia habet ampla etiam si ad arborum frondes comparantur" ; hence (2) a leaf, i. 57, 130, 182 ; iv. 36.

*frons* (gen. *frontis*), the forehead, ii. 55 ; iv. 48.

*fructus*, (1) produce, fruit, i. 148 : "Galla fructus est quaercus" ; fruit in general, iv. 22 : "neque florem neque fructum ferens" ; (2) a fruit, e.g. the berry of *Capparis* ii. 192 ; *Hedera*, ii. 199 ; *Solanum nigrum* and *S. miniatum*, iv. 77 ; the capsule of *Euphorbia Myrsinites*, iv. 170 ; the silicula of *Farsetia clypeata*.

*fruges* (pl.), lit. field crops, hence used, in place of *frumenta*, for corn, cereals, ii. 105, 107.

*frumentaceus*, cereal, ii. 108.

*frumentum*, lit. corn, hence a kind of corn, ii., introd.

*frustatim*, in pieces, i. 1 ; ii. 184, 190.

*frustum*, a piece, bit, ii. 190.

*frutex*, (1) a shrub, bush, i. 122 (*Atriplex Halimus*), 123 (*Paliurus australis*), 134, 135, 138 (*Vitex Agnus-castus*) ; ii. 192 (*Capparis*



*spinosa*) ; (2) a bushy or branched herb, ii. 119 (*Ervum Ervilia*), 141, 198 (*Anagallis arvensis*, *A. foemina*) ; iii. 92 (*Nigella sativa*), 97, 118 (*Marrubium vulgare*) ; iv. 72 (*Hyoscyamus*), 96 (*Scrophularia peregrina*).

*frūtīcāre*, to branch in a bushy manner, become bushy, i. 7, 16, 121 ; iv. 76 (*Withania somnifera*), 126.

*frūtīcōsus*, (1) bushy, applied to both shrubs and herbs, i. 14 ; ii. 121 (*Condyllocarpus*), 144 : " Crithmum . . . fruticosa haerbula est " ; iv. 111 (*Fumaria*) ; (2) shrubby, iii. 104 : " Fruticosa haerbula est, unicaulis."

*fūcāre*, (1) to rouge, paint, dye, colour, i. 91 ; iv. 101 : " Hoc fuco quidam putant, mulieres suum colorem mentiri. Cum tamen sit radícula eiusdem nominis, qua sese fucant " ; (2) hence to adulterate, iv. 68 : " Sed opion glaucio, gummi, aut sylvestris lactucae succo, adulterant. Verum glaucio fucatum in dilutione croci colorem reddit."

*fūligo*, a solid deposit of smoke, soot, i. 77, 79, 81, 84.

*fundēre*, lit. (1) to pour out, i. 34 ; hence (2) to exude, yield, i. 115 ; (3) to spread out, extend, i. 103 : " Arbor est coactae brevitatis, quae sese magis in latitudinem fundit."

*fungōsus*, spongy, i. 14 ; iii. 2, 93 : " Radix Laserpitio similis, sed minus crassa, acris et fungosa " ; iv. 182.

*fūñcūlus*, a cord, thread, i. 130 ; ii. 183.

*fūnis*, a rope, iii. 166, 167.

*furfur*, lit. (1) chaff, bran, i. 92 ; ii. 111 ; hence (2) scurf or scales on the skin, i. 34 : " Furfures, ulcera capitis manantia, scabiem, leprasque abstergit " ; i. 185 ; ii. 95.

*furfūrōsus*, scurfy, iii. 63, 68 : " Eligendum est purum, minime furfurosum."

*fūruncūlus*, a boil, i. 184, 185 ; ii. 95.

*gēnae* (pl.), lit. the cheeks, hence *gēnae* (*oculorum*), the eyelids, i. 6, 94, 134, 140 : " Quapropter in collyria additur, ad genarum erosiones perquam utilis."

*gēñcūlātīm*, (borne) at the nodes, several at a node, iv. 4.

*gēñcūlātus*, (1) jointed, i. 1 ; iv. 7 ; (2) nodose, with evident nodes, iii. 54, 56 ; iv. 33, 82 : " Caulem aedit geniculatum, ut foeniculi grandem."

*gēñcūlum*, a joint, node, i. 2, 14, 116 ; ii. 195 ; iii. 107, 160 ; iv. 5.

*gēnus*, a kind : (1) a kind in general, iv. 55 : " Duo eius genera. Unum laevis nominati, alterum acuti, qui in mucronem fastigiatur. Cuius etiam duo assignantur genera " ; (2) a group, iii. 164 : " Althaea . . . in sylvestrium malvarum genere est " ; (3) a major division in a classification, ii. 147, 195 ; (4) a genus, i. 86, 146 ; (5) a species, i. 101, 121, 134, 136, 138 ; ii. 95, 140.

*germen*, a young shoot, sprout or bud, i. 161 ; iii. 4 ; iv. 195.

*germinātto*, a point of origin or growth, iii. 121 : " ramulares enascuntur appendiculae, quae in terna singulis germinationibus exeunt folia."

- gestāmen*, lit. something borne or worn, hence an amulet, ii. 140.  
*gingivae*, the gums, i. 27, 33, 77, 89, 132, 142.  
*glāber*, hairless, bald, i. 6.  
*glans*, (1) an acorn, fruit of *Quercus*, i. 145 ; iv. 155 ; (2) a suppository, i. 1.  
*glans Iovis seu sardiana*, a chestnut, i. 147.  
*glans unguentaria* (Βαλανός μυρεψική), the fruit of *Balanites aegyptiaca*, iv. 163—see Dyer in Hort, Theophrastus, ii. 443, 488 (1916), et in Sandys, Companion to Latin Studies, ed. 3, 87 (1921).  
*glauçitas*, cataract, i. 63.  
*glēba*, a small piece or lump, i. 84, 98, 134.  
*grānum*, a grain of a cereal or a moderately large seed-like fruit or seed : (1) a grain (*caryopsis*) of a cereal, ii. 99 ; (2) an achene of *Ficus*, i. 183 ; *Nelumbo*, iv. 115 ; (3) a seed of *Eryum Ervilia*, ii. 119 ; *Capparis*, ii. 192 ; *Delphinium*, iv. 158 ; *Euphorbia Lathyris*, iv. 177.  
*grāvis*, lit. heavy, hence (of smell or flavour) strong, unpleasant, disagreeable, iii. 93 : “ Medicum et Syriacum minus viribus valent, et graviozem reddunt odorem ” ; iii. 96 ; iv. 141 : “ Cum siccis rosis cocta in vino, gravem oris halitum emendat.”  
*grāvitas auditūs*, hardness of hearing, iv. 152 : “ Item contra gravitatem auditus in aurem demittitur, ibique in alterum aut etiam tertium diem esse finitur.”  
*grāviter*, strongly, iii. 122 : “ Capitulo . . . graviter olente, non sine quadam suavitate.”  
*grossus*, an unripe fig, i. 73, 183, 185.  
*guttur*, the gullet, throat, i. 184.  
*hābere*, (special meaning), to consider, i. 131 : “ Hebenus optima habetur aethiopica et nigra.”  
*haerba* (= *herba*), (1) a herb, iii. 34, 94, 128 ; iv. 62 ; (2) the leafy part of a herb or shrub, excluding roots, underground stems and fruits, i. 134 ; iii. 77 : “ Vis radicis, haerbae et seminis exalfacere ” ; iii. 85 : “ Tam radicis quam haerbae succus adiecto melle illitus, oculorum aciem exacuit.”—cf. the pharmaceutical names “ Acalyphae Herba,” “ Lobelia herba.”  
*haerbācēus* (= *herbācēus*), (1) green in colour, ii. 161 : “ flores . . . foris haerbacei, et cum hiantes se pandunt lactei visuntur ” ; iii. 53, 121 ; iv. 66 ; (2) green or herby in smell, iv. 164 : “ Caetera porrum imitatur, atque haerbaceum virus olet.”  
*haerbārthus* (= *herbārthus*), a herbalist, ii. 187, 196 : “ haerbarius Crateuas.”  
*haerbīdus* (= *herbīdus*), green or greenish, iv. 92 : “ caule e medio emicante, palmum alto, umbellam haerbidosque flores et tenues gerente.”  
*haerbūla* (= *herbūla*), a little herb, ii. 193 ; iii. 104 ; iv. 70, 140.  
*hālītus*, the breath, i. 11, 77, 89 ; ii. 109 ; iv. 141.  
*hārundo*, a reed, i. 116.  
*haurire*, (1) to absorb, drink in, i. 39 : “ ubi dimidia hora humorem

hauserit, vehementius quam antea tunditur ” ; (2) to drink, swallow, consume, i. 65, 81, 182.

*hēbētiāre*, (1) to weaken, lessen, moderate, i. 33 : “ Ulcerariorum medicamentorum vires permistum hebetant ” ; (2) to dull, deaden, i. 87 : “ Acrimonias in renibus aut vesica hebetant ” ; (3) to dim, ii. 158 : “ Id copiosiore cibo oculorum aciem habetat.”

*hēbētūdo*, dullness, dimness, i. 27, 39, 143.

*hēmīna*, a liquid measure, half a pint, i. 33, 34, 37 ; ii. 86 ; iv. 155, 165.

*hiāns*, gaping, yawning, iii. 162.

*hirsūtus*, hirsute, shaggy, hispid, bristly, iii. 119, 154 ; iv. 12, 26, 29, 30, 69, 72, 73, 120 ; applied to a root covered with fine rootlets, iv. 58.

*hispidus*, rough, bristly, ii. 134.

*hōlus*, a vegetable, potherb, i. 113.

*horrēre*, to bristle, be armed, i. 23 ; ii. 146 : “ Sylvestrior magis spinis horret ” ; iv. 41, 146 : “ Huius sarmenta nullis horrent spinis.”

*horridus*, bristling, armed, i. 103 ; iii. 12.

*hortensis*, *hortensius*, grown in gardens, iv. 68, 74.

*hydrōmēli*, honey-water, hydromel, i. 1 ; iv. 1 : “ Quae ex hydromelē in potu, pituitosam vomitionem evocant ” ; v. 10.

*ictus*, a bite, sting, i. 1, 2 : “ Urinae stillicidio et serpentum ictibus auxiliatur ” ; i. 4 : “ Adversus scorpionum ictus remedio est ” ; i. 107 : “ Illita quoque vesparum apiumque ictibus opitulantur ” ; i. 145 ; ii. 123.

*iēcū* (*iōcīnor*, *iōcūr*), the liver, i. 2, 7, 152 ; ii. 198.

*iēiūnus*, fasting, iv. 64, 151.

*ilēōsus* (*ilīōsus*), suffering from colic, i. 139 : “ Trita folia cum exiguo pipere et vino pota, ileosis subveniunt.”

*ilēum* (*ilīum*), the groin, i. 33.

*illinēre*, to apply as a lotion or liniment, smear, anoint, i. 31 : “ Folia ex vino cocta utiliter ischiadicis illinuntur ” ; iv. 68 : “ In pervigiliis fronti temporibusque illinitur, ex aqua.”

*illitus*, (1) applied as a lotion or liniment, i. 1 : “ Quinetiam coctae et illitae, strumas, veteresque duricias emolliunt ” ; i. 5, 9, 13 ; ii. 158 ; (2) application as such (in abl.), v. 1 : “ Folia Vitium et triti capreoli, capitis dolores illitu mitigant ” ; (3) plated, i. 38 : “ Caro colligitur, et coniecta in pilam diligenter tunditur, postea in lebetem stanno illitum . . . demittitur.”

*illōtus*, unwashed, ii. 152 : “ Stomachicis illotas esse prodest.”

*imbēcillitas*, weakness, feebleness, iii. 2 : “ Id epotum facit ad inflationes, stomachi imbecillitatem, et omne genus doloris.”

*imbēcillus*, weak, feeble, debilitated, i. 146 : “ imbecillas membrorum partes corroborant ” ; i. 152 : “ Prodest praecordiis, imbecilli stomacho, et iocineri affecto, mista conferentibus cataplasmatibus ” ; i. 157 : “ Semen tamen imbecillius parit.”

*impētigo*, a scabby eruption on the skin, i. 143 : “ Lepras et impetigines sanat.”

- implēre*, lit. to fill up, hence to amount to a certain measure, i. 121: "rami quinum cubitorum longitudinem implent."
- inānis*, hollow, fistular, iv. 12.
- incānus*, whitish, iii. 41.
- incernere*, to sift, to separate by sifting or straining, i. 61: "Oleum protinus ab aqua, quae simul expressa fuerat colo incerni oportet"; ii. 119: "Molitaque farinario cribro incernuntur."
- incernicūlum*, a sieve, i. 6.
- incisūra*, lit. an incision, cutting, hence a segment, iii. 121: "flos candidus, Lilio similis, multas incisuras habens."
- indere*, to administer as a clyster, i. 135.
- inductus*, overlaid, plated, i. 35: "In lebetem oris lati stanno inductum, funditur olei albi . . . congius unus."
- industriā*, by an artifice, i. 81: "Thus . . . indicum . . . rotundum industria factitant. Nam in quadrangulares formas dissectum doliis versant, donec rotunditatem contrahet."
- infector*, a dyer, i. 149: "Ita vocari solet, quoniam coriorum infectores ea utantur ad inspissandas pelles"; ii. 205: "Glastum quo infectores lanarum utuntur, folium habet plantagini simile."
- infectus*, dyeing, i. 29: "Itali tamen ob succi copiam, et coloris venustatem, ad thuiæ infectus usurparunt."
- infestare*, to trouble, disturb, i. 25, 125; v. 3: "Sapa aut musto conditæ, stomachum magis infestant."
- inficere*, to stain, dye, colour, i. 30; iv. 26: "Quæ aestate provenit, manus inficit sanguineo colore."
- infrēnare*, to restrain, check, i. 81: "Infrenatque sanguinis eruptiones, etiam si cerebri membranis effluat."
- infundere*, lit. (1) to pour in, inject, i. 157: "Purulentis auribus infunditur"; (2) to inject as a clyster, i. 33, 149, 184: "Caeterum cum ruta coctæ torminibus infunduntur"; (3) to administer (to a person for a disease) i. 1: "Ischiadicis infunditur"; i. 23: "Ad nomas genitalium et sordida ulcera infunditur"; iii. 8.
- infusus* (past part. of *infundere*), poured in, injected, i. 130: "Medetur aurium doloribus cum hydromelite aut rosaceo infusum"; ii. 133: "Caput purgat naribus infusus."
- inguen*, the abdomen and groin, i. 57: "Lumborum inguinumque dolores lenit"; iv. 20.
- inspissare*, (1) to thicken, i. 47, 48; (2) to tan, i. 149.
- inspissatio*, thickening, i. 6.
- intempestivē*, unseasonably, at the wrong time, iv. 157.
- intempestivus*, unseasonable, hence (of a drug) not in the right condition, i. 5.
- internodium*, an internode, i. 14.
- interstitium*, an interval, iv. 36, 202.
- intervallum*, an interval, iii. 103, 161; iv. 16, 44, 64.
- inritus*, pounded up, i. 145, 149; ii. 192.
- ischiodicus*, suffering from lumbago or sciatica, i. 1, 31, 111; ii. 193; iii. 8, 42; iv. 1, 106.
- iuncēus*, rush-like, slender, iv. 49, 67.

*iuncus*, a slender rush-like stem, iii. 151 ; iv. 8, 187.

*iūs*, a thick infusion or broth, i. 157 ; iv. 3, 141, 201 ; *iūs gal-  
linācēum*, chicken broth, iv. 177.

*iūscūlum*, an infusion or broth, iv. 152.

*lābellum* a small basin or tub, i. 52, 53, 61.

*lac*, lit. milk, hence milky juice, latex, i. 183, 184 ; iv. 159.

*lācērtus*, a muscle (esp. of the upper arm), i. 67, 70.

*lactēus succus*, latex, iv. 159.

*laedēre*, lit. (1) to harm, injure, ii. 114 : " Laedunt ea exulceratam  
vesicam et renes " ; hence (2) to trouble, i. 184 : " Fici maturae  
recentes stomachum laedunt."

*languīdus (colōre)* dull, pale (in color), i. 7 : " Folia habet oblonga,  
colore in flavum languido."

*lānūginōsus*, villous-pubescent or hirsute, e.g. the indumentum  
of the peduncle of *Anemone coronaria*, ii. 195 ; that of *Ranunculus  
lanuginosus*, ii. 194 ; appressed villous-pubescent, e.g. the leaves  
of *Cynoglossum officinale*, iv. 130.

*lānūgo*, a very general term covering pubescence, villosity, long  
silky indumentum, pappus and wool : applied to the appressed  
pubescence of *Astragalus Poterium*, iii. 16 : the lanate indumentum  
of *Origanum Dictamnus*, iii. 35 ; of leaves of *Althaea officinalis*,  
iii. 164 ; the silky indumentum of a reed inflorescence, i. 116 ; the  
down on the gynophore of *Typha*, iii. 132 ; the pappus of Compositae,  
iv. 120, 132 ; an individual pappus hair, iii. 9 ; *lānūgo aspēra*, the  
hispid indumentum of *Symphytum officinale*.

*lātex*, a liquid, i. 149 : " Latex in quo semen maduit decoctus,  
cogitur coitque, efficacior ipso semine."

*laxāre*, to loosen, i. 152 : " Laxatos artus committit " ; i. 157.

*lēbes*, a copper pot, caldron or basin for cooking, i. 35, 38.

*lēgūmentum*, pulse, ii. 159.

*lēnīre*, to alleviate, mitigate, i. 3, 56.

*lentīgo*, a spot, freckle, i. 1, 13, 40.

*lentor*, a viscous secretion, i. 130.

*lentus*, pliant, tenacious, ii. 175, 188 ; iv. 144, 147.

*lepra*, a scaly or scabby disease of the skin, i. 34, 143 : " Lepras  
et impetigines sanat."

*lēvāre*, to lessen, alleviate, mitigate, i. 109 : " Tumores et in-  
flammationes levant."

*līber*, the inner bark, bast, i. 26, 144.

*līēn*, the spleen, i. 2, 7, 118, 183 ; ii. 112 ; iv. 26.

*līēnōsus*, splenetic, i. 1, 118 ; ii. 120.

*līgūla*, lit. a little tongue, hence the tongue or reed of a flute, i.  
116.

*līnāmentum*, lint, i. 81.

*līnctus*, a liquid preparation of a mucilaginous or syrupy nature,  
to be swallowed slowly to relieve coughs etc, i. 91 : " Ea in linctu  
magnopere prodest tussi veteri."

*līngēre*, lit. to lick, lick up, hence to swallow slowly as a linctus,  
iii. 30.

*lingua*, lit. (1) the tongue, ii. 189 ; hence (2) a labellum, iii. 162.  
*linēum*, a linen cloth, iv. 141, 156.  
*līppitūdo*, a bleary condition of the eyes, i. 11, 82, 131.  
*liquāmen*, a liquid mixture or extract, ii. 153.  
*liquāmentum*, a liquid mixture or extract, i. 88 ; iv. 165.  
*lixivium*, lye, i. 185 ; ii. 133, 134.  
*lōcūlus*, lit. a compartment, hence a legume, i. 136.  
*lōmentum*, (1) bean-meal, ii. 115 ; (2) meal of the *fāba aegyptia*  
*(Nelumbo nucifera)*, ii. 116.  
*lōtus*, washed, ii. 184.  
*lūtēum ōvi*, the yolk of an egg, i. 184 ; ii. 189.  
*lūtum*, clay, mud, i. 6, 81 ; ii. 190.  
*luxāre*, to sprain, i. 116, 138, 180 ; ii. 139, 189 ; iv. 95.  
*mācērāre*, to soften by steeping, macerate, i. 47, 52, 56, 58.  
*mācēria*, a wall, esp. of stones without mortar, iii. 44 ; iv. 38,  
42, 92.  
*mācūla*, a spot, blotch, i. 39 : “ Maculas tollit in facie ” ; ii. 181 :  
“ Folia habet haederae, purpurea, varia, in quibus susquedeque  
albicant maculae.”  
*mādēfācēre*, to soak, steep, i. 58.  
*mādēfactus*, moistened, soaked, steeped, i. 6, 27, 29 : “ Made-  
factas manus inficit ” ; i. 30 : “ Crocomagma . . . optimum . . . made-  
factum croci colorem reddit ” ; i. 52, 117 ; iv. 124 : “ Radix in vino  
madefacta ” ; v. 1 : “ Eadem efficiunt madefacti in aqua capreoli  
et poti.”  
*mādēre*, lit. to be wet or moist, hence (1) to be soaked or steeped,  
i. 57, 58, 126 ; iv. 119 : “ Aqua in qua radix maduerit, in potu data,  
feras mitigat et cicures facit ” ; (2) to be full of, abound in, iv. 87,  
165 : “ Radix lacteo succo madet ” ; iv. 169.  
*mādescēre*, to be soaked, to become soft by steeping, i. 52, 153 ;  
ii. 175 ; iv. 139.  
*mādīdus*, moist, soaked, i. 41.  
*mālācia*, nausea, i. 168 ; v. 1, 6.  
*mālagma*, an emollient poultice, i. 1, 4, 64, 90, 91, 115, 152.—  
“ Malagmata were substances applied to the skin to soften it, such  
as poultices,” Wootton, ii. 294.  
*mālēōlus*, an ankle, iv. 164.  
*mālum*, a large fleshy fruit, originally (1) an apple, i. 161 ; hence  
(2) *mālum Armēniacum* seu *praecox*, an apricot, i. 167 ; (3) *mālum*  
*Cōtōnēum*, a quince, i. 162 ; (4) *mālum Mēdicum* seu *citrēum*, seu  
*cēdromēlum*, a citron, i. 168 ; (5) *mālum Persicum*, a peach, i. 166 ;  
(6) *mālum Pūnticum*, a pomegranate, i. 153 ; also (7) *mālum cānīnum*  
seu *terrestre*, the fruit of *Mandragora*, iv. 79.  
*mānāre*, to flow, run, i. 34 : “ ulcera capitis manantia . . .  
abstergit ” ; i. 37 : “ In palmyris syriae quod Elaeomeli vocant,  
ex quodam caudice manat, crassius melle, sapore dulci ” ; i. 38, 39,  
79, 91, 135 ; iv. 158.  
*mandāre*, to consign, i. 38 : “ Nam repurgatos ricinos molae  
mandant, et accurate molitos per sportulam organo exprimunt.”

*mandĕre*, to chew, masticate, eat, i. 25 : " Manditur, aut decocto os colluitur, commendandi halitus gratia " ; iv. 27, 115 : " Radicem lotos haec habet, mali cotonei similitudine, qua cruda coctaque manditur. "

*mandŭcātus*, chewed, masticated, i. 4 : " Aliud cypiri genus . . . manducatum croci vim reddit. "

*mansus*, chewed, iv. 10 : " Dentium dolorem mansa mitigat. "

*marcescĕre*, to wither, iii. 5.

*mĕātus*, a pore, i. 135 : " Cutis meatus obstruit. "

*mĕdĕla*, a healing medicament, cure, remedy, iii. 3 : " Imposita ut lycium, vulneraria est, et ulcerum cuniculatim depascentium medela. "

*mĕdĕri*, to heal, cure, be good for, i. 27 ; iv. 79 ; v. 1.

*mĕdulla*, lit. (1) marrow of bones, i. 63, 106 ; iv. 78 ; hence (2) pith, iii. 89.

*mĕlinus*, quince-yellow, iii. 155, 156.

*membrāna interkursans*, a septum of a capsule, iv. 177 : " fructum . . . gerit, triplici concoceptaculo insignem, . . . in quo grana interkursantibus membranis distincta continentur. "

*messĭs*, lit. harvest, hence harvest-time, ii. 187 : " Floret messibus albacum " ; iv. 151, 179.

*mĕtĕre*, to gather, collect, iii. 35 : " Metunt semen aestate et autumnno. "

*mĕtrĕta*, a liquid measure of about 9 gallons, iv. 79.

*mĭca*, a grain, small fragment, i. 83 : " Manna thuris probatur candore, micarum frequentia, et puritate. "

*mĭna*, a weight of 100 drachmae (rather less than 1 lb. troy), i. 28 ; iv. 79 : " Ternae minae in vini dulcis metretam, coniiciuntur. "

*minŭtus*, fine, slender, iii. 130 : " Caulibus minutis et pilosis sesquipedalibus " ; iii. 141.

*mitĭgāre*, to soothe, mitigate, allay, v. 1, 117 : " Dolores in saccis fotu mitigat. "

*mĭtis*, mild, gentle, i. 140 : " ocularibus medicamentis ob suam mitiorem vim convenientior est " ; ii. 175, 185, 191.

*morbus cōmittālis*, epilepsy, i. 99.

*mōvēre*, to stir, i. 184.

*mŭcrōnātus*, tapered, pointed, acute, iv. 23 : " folium gladii modo mucronatum " ; iv. 25, 92, 147, 151.

*mulcĕre*, to alleviate, i. 25, 52, 86 ; iv. 107 : " dentium dolorem mulcet. "

*mulsa* (sc. *āqua*) honey-water, i. 86.

*mulsum*, mead, honey mixed with wine, i. 17.

*mulsus*, mixed with honey, sweetened, i. 27 ; iv. 125.

*mundus*, lit. (1) clean, i. 34, 81 : " In fictili mundo thus crematur " ; hence (2) cleared, open, iv. 3 : " Vettonica nascitur in pratis et montibus, locis mundis, et opacis, circa frutices. "

*mŭria*, brine, iv. 79 : " Folia servantur in muriis, eosdem ad usus " ; iv. 179 : " Muria conditur. "

*muscārtum*, lit. a fly-flap, hence (1) an umbel, iii. 53, 54, 56, 81 ; (2) the corymbose cyme of *Sambucus*, iv. 185.

*muscōsus*, mossy, moss-like, a term applied to inflorescences with crowded small flowers, i. 118, 126 : "Flore candido, muscoso, odorato."

*nervōsus*, (1) fibrous, stringy, i. 14 ; iii. 16 : "Radices demittit binum ternumve cubitorum nervosas, et firmas" ; (2) full of nerves, iv. 23 : "Iridi simile erat [folium] nisi minus et angustius videretur, et gladii modo mucronatum, nervosumque."

*nervus*, lit. (1) a sinew, tendon, i. 70, 185 ; ii. 109 ; iv. 164 ; *nervorum rēsōlūtiō*, paralysis, i. 5, 17 ; hence (2) a nerve of a leaf, iv. 183.

*nīdor*, vapour, fumes, iv. 4 : "Acerrimum nidorem suffita reddit" ; iv. 62.

*nīti*, to rest on, arise from, grow from, iv. 1 : "Radicibus nititur ut veratri tenuibus" ; iv. 31.

*nītor*, lit. brightness, sheen, hence sleekness, beauty, i. 35 : "Foeminae ad commendandum faciei nitorem eo utuntur" ; i. 56 : "Pigmentis ad conciliandum faciei nitorem inseritur" ; i. 89.

*nōdus*, lit. a knot, hence (1) a swelling, tumour, i. 185 : "Grossi . . . coctae illitae et strumas nodosque omneis emolliunt" ; (2) a node of a stem, i. 14 : "tenuibus ramulis, ac frequentibus nodis cinctum."

*nōmē*, a rodent ulcer, i. 103 : "Utriusque folia nomas sistunt" ; i. 140 : "Trita autem et imposita . . . nomas cohibent."

*nōtus*, lit. (1) known, ii. 187 : "Hastulam regiam graeci asphodelon, alii Narthecion, Romani albucum vocant, vulgo notum" ; hence (2) well-known, i. 110 : "Fraxinus arbor nota est" ; i. 182.

*nūclēus*, lit. (1) the kernel of a nut, e.g. of the walnut, i. 180 ; of *Balanites aegyptiaca*, iv. 163 ; a pine kernel (seed), vi. 15 ; hence (2) a stone (endocarp) of *Crataegus Pyracantha*, i. 124 ; *Olea europaea*, i. 125, 140, 177 ; (3) the seed of *Ruscus*, iv. 147 : "Baccae per maturitatem rubescunt, rotundae, a medio folio dependentes, osseo intus nucleo" ; *Delphinium Staphisagria*, iv. 158 ; *Vitis vinifera*, v. 3 : "Nuclei acinorum adstringendi vim obtinent" ; the hard seed of palms, i. 151 ; (4) the hard part of the seed of *Punica Granatum*, i. 153 ; (5) a "clove" of garlic, ii. 169 : "Reliqua vero magna et candida, ex pluribus coagmentantur nucleis, quos aglithas graeci nominant."

*nux*, lit. (1) a nut, in contradistinction to *nūclēus*, its kernel ; hence (2) the kernel of a nut or of a drupe, e.g. of *Corylus*, i. 181, and *Amygdalus communis*, i. 178.

*nux āmāra*, a bitter almond, *Amygdalus communis* var. *amara*, i. 178.

*nux āvellāna*, lit. (1) a hazel nut, the fruit of *Corylus Avellana* ; (2) used in place of *nux pontica*, (q.v.), i. 178, 181.

*nux graeca*, a sweet almond, *Amygdalus communis* var. *dulcis*, i. 178.

*nux iūglans*, a walnut, *Juglans regia*, i. 180.



*nux pīnĕa*, a pine cone, strobilus of *Pinus* spp., i. 86, 87, 90, 91, 179.

*nux pontīca*, a kind of filbert, possibly the fruit of *Corylus colurna*, i. 101.

*obdūcere*, lit. (1) to cover, i. 48; hence (2) to draw together, close, heal, i. 47: "Ideo medicamentis miscetur quae cicatricem obducunt."

*oblīnĕre*, lit. (1) to smear over, i. 52: "Sed quoties id feceris, vasa melle oblini debent"; to paint (a wound), iv. 116: "Vulnera recentia ab inflammatione vindicat. Si vel viride, vel siccum ex aceto, oblinatur"; (2) to coat (pills), iv. 169: "Fauces autem exasperat. Quapropter catapotia caera aut decocto melle, oblini par est, et hoc modo dari."

*oblongus*, rather long, i. 7, 31, 121, 125, 174; ii. 145, 196; iv. 12, 27: "Haec a priore distat, quod minora habeat folia, sed simili modo aspera, ramulos exiles, florem purpureum, radices rubras, oblongas."

*ōbōlus*, the sixth part of a drachm, iv. 79: "Succus duobus obolis ex mulso potus, ut Veratrum, per vomitiones bilem atram pituitamque extrahit"; iv. 146, 152.

*obsōnta* (pl.), food, victuals, i. 29, 44, 113, 148, 182; ii. 174; iv. 200.

*obtinĕre*, to possess, ii. 116: "Adstringendi facultatem obtinet."

*ōdōrāmentum*, an aromatic herb or spice, a perfume, i. 30, 64.

*offa*, a lump, mass, piece, i. 39, 80, 130; ii. 86, fol. 39 r.

*offūla*, a small piece, i. 64.

*offundĕre*, lit. to pour out or over, hence to spread over, i. 22: "Abstergit, quae tenebras, oculorum pupillis offundunt"; ii. 177.

*ōlĕa*, the olive tree, i. 122, 127.

*ōlīva*, lit. (1) an olive (fruit), i. 125; hence (2) the olive tree, i. 126.

*olla*, a pot, ii. 86, fol. 37 v, 38 r, 39 r.

*ollūla*, a little pot, i. 81.

*ōlus*, a vegetable, potherb, ii. 124: "Tam folium quam radix in olera recipitur"; ii. 126, 127, 130, 132, 184: "Radix cruda coctave, ad sanorum usus, pro olere recipitur."

*ōpercūlum*, lit. a lid, hence an orifice, ii. 116.

*ōpton*, *ōptum*, opium, latex of *Papaver somniferum*, iv. 68.

*ōptūlāri*, to relieve, i. 22, 64, 76, 86, 107; iii. 41.

*orbātus*, lit. deprived of, hence lacking, iv. 79.

*orgānum*, lit. an instrument, engine, hence a press, i. 38, 72.

*orthopnoea*, difficulty of breathing except with the head erect, i. 31; iii. 41, 58.

*ossicūlum*, a pyrene of a drupaceous fruit, i. 171: "Fert pomum suave, exiguum, tribus intus ossiculis."

*palmāris*, measuring 9 inches, iv. 62.

*palmĕs*, lit. (1) a young shoot, esp. of a climbing plant, ii. 199; iii. 4; hence (2) a slender stem, iii. 59.

*palmĕus*, 9 inches long or broad, iii. 143.

- palmūla*, a date, fruit of *Phoenix dactylifera*, iv. 177.
- palmus*, a measure of 9 inches, iii. 32, 154, 155, 175 ; iv. 54, 58, 63, 79, 80, 92, 104, 202.
- palpebrae* (pl.), (1) eyelashes, i. 90, 91, 94, 151 ; (2) eyebrow hairs, iv. 111.
- pampīnus*, a tendril, iv. 47, 122, 194.
- pānīcula*, the panicle of a reed, i. 116 ; the spike (" strobilus ") of *Acanthus*, iii. 18.
- pānīfictum*, a roll of bread, cake, ii. 99.
- pappus*, the down on fruits and seeds, e.g. the pappus of Compositae, iii. 9, 132 ; iv. 85, 98 ; the down on the gynophore of *Typha*, iii. 136.
- pāpūla*, a pustule, pimple, i. 184.
- pārēre*, lit. (1) to bring forth, bear, i. 157 : " Semen tamen imbecilius parit " ; hence (2) to produce, cause, i. 145.
- pārītīnae* (pl.) ruined walls, iv. 92.
- pārōnychium*, a whitlow, i. 140.
- partīcūlātīm*, in pieces, i. 31 : " Foditur aestate radix, particulatimque dissecta siccatur."
- partus*, a foetus, i. 1, 5, 22, 23, 108, 143.
- passum*, raisin-wine, i. 29, 31, 87, 108, 178 ; iii. 46.
- pastillus*, a lozenge, i. 6, 77, 133, 135, 140, 158, 183 ; iv. 156.—  
" Troches from the Greek trochiscos, a cone. Medicines in a hard form. Subsequently called in Latin, pastilli, and in English lozenges. They were first made in the shape of cones," Wootton, ii. 299.
- pectus*, the breast, chest, i. 2, 184 ; ii. 123.
- pēdīculus* (dim. of *pēs*), lit. (1) a little foot ; hence (2) a foot-stalk (petiole) of a leaf, e.g. of *Hedera*, ii. 199 ; *Potentilla reptans*, iv. 45 : " folia mentae, quina singulis pediculis " ; *Petasites hybridus*, iv. 109 ; (3) the entire axis (petiole and rhachis) of a pinnate or pinnatifid leaf, e.g. of *Sanguisorba officinalis*, iv. 37 ; the rhachis of a fern leaf, iv. 196 : " Folia sine caule, sine fructu, sine flore, ex uno pediculo, cubitali longitudine exeunt, multifida et lateribus pinnata."
- pēdīculus* (dim of *pēdis*), a louse, ii. 199 : " Illitu pediculos enecat."
- pellēre*, to expel, drive out, i. 19, 143.
- pelvis*, a basin, iv. 156.
- perfrictio*, an abrasion, chafing, i. 4, 33 : " A perfrictionibus corpus tuetur."
- perfrictus*, rubbed over, v. 1.
- perfundēre*, lit. to pour over, hence to bathe, i. 181 ; iv. 3, 181.
- pernio*, a chilblain, i. 135 ; ii. 119.
- perniuncūlus*, a chilblain, i. 54.
- perpētūō virens*, evergreen, i. 20.
- pessum*, a pessary, i. 1, 41, 144.
- phoenīcōbālānus*, a sun-dried Egyptian date, i. 150.

*phrēniticus*, delirious, mad, i. 63: "Somnum allicit. Quare persaepe phreniticis subvenit"; iii. 88.

*picātus*, covered with pitch, i. 91; iii. 8.

*pigmentārius*, a dealer in drugs, cosmetics and unguents, i. 23; iv. 26: "Radice pigmentarii utuntur ad spissamenta."

*pigmentum*, lit. a paint, pigment (for painting); hence a paint (for use as a cosmetic), i. 56: "Pigmentis ad conciliandum faciei nitorem inseritur"; i. 94: "Usui est ad pigmenta quibus palpebras nunt et venustant."

*pīla*, a pounding-block, mortar, i. 39; iv. 159: "Tunditur etiam radix in pila"; iv. 169.

*pīla*, a ball, iv. 188: "emittit . . . fructum in speciem mediocris pilae, conglomeratim."

*pīlōlus*, a skull-cap, small hat, iii. 4: "Una quae foemina vocatur . . . flore candido tanquam pileolo."

*pīlōsus*, lit. hairy, hence bristly, e.g. the receptacle (torus) of *Agrimonia Eupatoria*, iv. 44: "Semen medio caule erumpit, pilosum, deorsum spectans."

*pīlūla*, a little ball, e.g. the infructescence of *Sparganium*, iv. 24; that of *Platanus*, i. 109; iii. 6; iv. 77; the female cones of *Cupressus*, i. 100.

*pinguis*, lit. (1) fat, fleshy, ii. 144, 194; iii. 24; hence (2) thick, i. 1: "Folia fert gladiolae, sed maiora, latiora, et pinguiora"; sometimes (3) used apparently by mistake for *nitidus*, shiny, glossy, ii. 141; iii. 125.

*pinnātus*, feather-like, pinnate, iv. 196.

*pistillum*, a pestle, i. 39; ii. 185.

*pītūita*, mucus, phlegm, i. 1, 113; ii. 123: "Decocta contra veterem tussim, et pituitae crassitiem in pectore, efficax est"; ii. 171, 195.

*pīxis* (for *pyxis*), a small box for unguents, i. 61.

*plācentūla*, a little cake, iv. 200.

*pōdagra*, gout in the feet, i. 16: "Decoctum iocineri, renibus, podagrae, potu convenit."

*pōdagricus*, a gouty person, i. 16: "Et podagricis confert."

*pōlenta*, *pollenta*, barley-meal, i. 100, 107, 184; ii. 96, 158; iv. 79.

*pollen*, lit. (1) flour, i. 83; ii. 95, 158, 190; v. 5; hence (2) fine dust, powder, ii. 166, 189; iii. 98.

*pollex*, lit. (1) the thumb; hence (2) a thumb's breadth, a measure of one inch, iii. 84: "Radix longa est pollicis crassitudine, gustu fervidissimo"; iii. 118; iv. 79.

*pollicāris*, measuring an inch in length, breadth or thickness, iv. 91.

*pōmum*, an edible fruit, i. 161 (*Malus*), 116 (*Amygdalus persica*) 171, 172 (*Mespilus*), 176 (*Prunus*), 182 (*Morus*), 183 (*Ficus*); iv. 79 (*Mandragora*).

*porrācēus*, leek-green, iii. 102, 138; iv. 3.

*posca*, sour wine mixed with water, ii. 183, 184; iii. 34, 93; iv.

156, 169.—“ A sour wine which was largely drunk by the Roman soldiers,” Wootton, i. 71.

*præbēre*, (1) to furnish, supply, afford, iv. 68 : “ Id medicamentum . . . doloris levamentum præbet ” ; (2) to produce, cause, i. 139 : “ Cortex eosdem præbet effectus ” ; i. 147 : “ Sardanæ glandes . . . similesque effectus præbent ” ; (3) *vicem præbēre*, to take the place (of ), iv. 106 : “ Quin et cum melle, eclegmatis vicem præbet.”

*præclūsus*, obstructed, i. 3 : “ præcluserum renum vesicæque farctæ vitia potu leniunt ” ; i. 38.

*praelum*, a press, iv. 68 : “ Aliqui capita ipsa et folia tundunt, et praelo exprimunt, terentesque in mortario, digerunt in pastillos ” ; iv. 79.

*præstāre*, (1) to excell, be superior (to), i. 33 : “ Praestat recens, odoratum, quod non mordeat ” ; i. 145 : “ Iligneæ glandes viribus quaernas præstant ” ; (2) to effect, perform, do, be serviceable for, i. 103 : “ Et suffitu idem præstant ” ; i. 111, 117 ; ii. 114 ; (3) to keep, preserve, maintain, i. 113 : “ Humor . . . cuti illitus nitorem inducit, faciemque splendidiorem præstat ” ; (4) to yield, furnish, afford, i. 29 : “ Elegantem colorem præstat ” ; ii. 153 : “ Doloris levamentum præstat ” ; iv. 72 ; (5) to cause, produce, i. 134 : “ Asseverant etiam crudam in potu, eosdem effectus præstare.”

*privātīm*, particularly, especially, ii. 86 : “ Privatim taurorum pingua sic curari debent ” ; ii. 95 : “ Privatim callos pedum, clavosque extenuat ” iv. 2, 70, 166.

*prōbāre*, to approve, esteem, i. 70, 130 : “ Maxime probatur odoratum, subviride . . . quale in cypro gignitur.”

*prōcaerus*, tall, long, iii. 167 : “ caulibus procaeris.”

*prōcidētia*, (pl.) prolapsed parts of the body, i. 88, 99.

*prōcidere*, to fall down or forwards, hence to protrude, i. 135 : “ Procidentes oculos reprimat.”

*prōdesse*, to be useful, be good for, i. 25, 31, 101 ; iv. 69 ; v. 1.

*prōficere*, to be useful, serviceable, i. 13, 56 : “ Ambustis et pernionibus addita caera proficit ” ; iv. 68.

*prōmēre*, to produce, put forth, iv. 7 : “ Flores per singulos foliorum exortus promit, candidos.”

*prūna*, a live coal, i. 81 : “ Fictili etiam novo vivacibus prunis torretur ” ; i. 91.

*psilōtrum*, a depilatory, i. 4.

*psōra*, the itch, scab, i. 38.

*pterygium*, a membranous outgrowth from the inner corner of the eye, i. 135, 149, 157, 184 ; iii. 6 ; iv. 169.

*ptisāna*, lit. (1) barley meal, crushed barley, i. 33, 184 ; iv. 151 ; hence (2) barley water, i. 99 ; ii. 96.—“ Tisanes, formerly Ptisans, are mentioned as favourite forms of administering the simpler kinds of remedies by Celsus. The word was derived from “ ptissein ” to crush, and was applied first to barley water, made from crushed barley. In French pharmacy Tisanes, mostly infusions of herbs, are still very familiar,” Wootton, ii. 299.

*puls*, pottage, porridge, ii. 100, 104, 116 ; iv. 151.

*pulticūla*, pap, gruel, ii. 102.

*pūnicēus*, scarlet, e.g. the petals of *Papaver Rhoeas*, iv. 67.

*pūnicum* (sc. *mālum*), the pomegranate fruit, i. 153.

*pūsillus*, very small, insignificant, iv. 137 : " *Pusilla gerit folia, similia coriandri, serrata.* "

*pūtāmen*, lit. that which is pruned, trimmed, peeled, or husked off, hence (1) the rind or shell (pericarp) of a fruit, e.g. of *Punica Granatum*, i. 155 ; *Corylus*, i. 181 ; *Quercus*, i. 144 ; (2) the stone (endocarp) of *Amygdalus*, i. 178 ; the shell (endocarp) of *Juglans*, i. 180 ; (3) the husk of a cereal, ii. 99.

*quadrantālis*, three inches long or broad, iv. 13, 151.

*quadrātus*, square in section, iv. 1, 15, 36.

*quaernus*, of, or relating to an oak, i. 145, 149.

*quallus*, a wicker basket used for straining, i. 58 ; ii. 111.

*rācēmātīm*, (arranged) like a bunch of grapes, i. 127 ; iv. 165, 195 ; in a cluster, ii. 178 ; iv. 152 ; in a spike, ii. 184.

*rācēmōsus*, spicate, ii. 183.

*rācēmus*, a cluster of berries, ii. 176 ; iv. 145.

*rādīcūla*, soapwort, *Saponaria officinalis*, i. 126 ; ii. 180 ; iv. 10.

*rādix*, a root or underground stem : (1) a root, ii. 178, 200 ; iii. 7 ; (2) a rhizome, i. 1 ; ii. 177 ; iv. 7, 33 ; (3) a corm, ii. 185 ; iv. 93.

*rāmentia* (pl.), shavings, chips, i. 101, 110, 173 ; scrapings, ii. 149, 151 ; iii. 53.

*rāmūlus*, lit. (1) a small branch, ii. 129, 135 ; iii. 79 ; (2) a small stem, iv. 60 ; a slender stem, iv. 64, 97, 147 ; (3) the leaf-rhachis of *Asplenium*, iv. 138.

*rāmus*, lit. (1) a branch, i. 134 ; ii. 174 ; iii. 87 ; iv. 60 ; hence (2) a small stem, iv. 63 ; (3) the rhachis of the pinnate leaf of *Sambucus nigra*, iv. 184.

*rātto*, a method, i. 47, 49, 56 ; ii. 119 : " *Parandae farinae ratio haec est* " ; iii. 3 : " *Succi extrahendi ratio haec est* " ; iv. 68.

*rēcīdens*, falling back, turned back, iv. 29.

*rēcondēre*, to store away, i. 1, 6, 15, 31, 58 ; ii. 184 ; iii. 3 ; iv. 1, 68, 72 ; v. 3.

*reddēre*, lit. (1) to restore, renew, i. 181 : " *Crematarum cinis cum axungia aut adipe ursi perunctus alopecii capillum reddit* " ; hence (2) to render, make, i. 182 : " *Decoctus autem aereo vase atque insolatus adstringentior redditur.* "

*rēdīgēre*, to reduce, i. 81.

*rēnes*, the kidneys, i. 3, 5, 7, 19, 152, 184.

*rēpurgāre*, lit. (1) to cleanse thoroughly, i. 38, 39 ; hence (2) to cleanse off, purge away, remove, i. 40 ; iv. 182 bis : " *Foliis cum melle tritis sordida ulcera et crustosa repurgantur.* "

*rētūsus*, weakened, lost, iii. 22 : " *Huius increbuit usus ad . . . retusas voces.* "

*rheumātismus*, a discharge, flux, iv. 158 : " *Rheumatismum gingivarum sistit.* "

*ricīnus*, lit. (1) a tick, i. 105 : " *Inhaerentes ricinos enecat* " ; hence (2) the seed of the castor-oil plant, *Ricinus communis*, i. 38.

*rigens*, numb, i. 1.

*rigor*, shivering (of fever), i. 60, 70, 73.

*rigua* (sc. *lōca*), well-watered places, iii. 8, 18, 124 ; iv. 6.

*rosāceum* (sc. *ōlĕum*), oil of roses, i. 1, 34, 92 ; ii. 116 ; iv. 182.

*rotundus*, round, spherical, circular, hence terete, iv. 92.

*rūdis*, a stirring-stick, spatula, iii. 8.

*ruffāre* (= *rūfāre*) to dye red, i. 126 : " Capillum ruffant trita folia."

*ruffus* (= *rūfus*), red, reddish, i. 18, 135 ; ii. 171, 191 ; iii. 91, 93, 147 ; iv. 25, 54, 67.

*rūgōsus*, wrinkled, iii. 118 : " Folium pollicem aequat, subrotundum, hispidum, rugosum, gustu amaro."

*saepes*, a hedge, iv. 42.

*sānāre*, to heal, cure, iii. 6 ; iv. 69 ; v. 1.

*sanguinolentum*, a bleeding wound, i. 154. .

*sanies*, lit. (1) bloody matter, i. 6 ; hence (2) discharge of juice, i. 174 : " Sanies quam virentia folia torrendo resudarunt, impetigini convenienter illinitur " ; v. 1 : " sanies quam accensa sarmenta Vitium exudarunt."

*sāpa*, must, new wine boiled thick, to one third of its original volume, i. 29, 31, 176.

*sāpere*, to taste of, iv. 114 : " Ea digitis trita erucam olent, gustataque cicer sapiunt."

*sarmentum*, (1) a twig, a rod- or switch-like branch, i. 12, 15 ; (2) a slender twining or climbing shoot, iv. 145, 146, 188, 193, 194.

*sātivus*, lit. (1) sown ; hence (2) planted, cultivated, iv. 68.

*scāber*, lit. (1) rough, scabrous, i. 13 : " Damnatur candicans, scabra, hircinum virus redolens, et quae tenui fistula et scabra cute sit " ; iii. 57 ; iv. 49 ; hence (2) rough-haired, e.g. the leaves of *Papaver Rhoeas*, iv. 67 ; the stem of *Salvia Aethiopis*, iv. 106.

*scābles*, the scab, itch, mange, i. 5 : " Scabiem ex aceto illitum adimit " ; i. 34, 49 : " Hoc scabiem iumentorum canumque sanat " ; i. 105, 152.

*scabricies*, roughness, e.g. of leaves, clothing and the tongue, iii. 38, 39 : " Linguae scabriciem confricta laevigat."

*scāpus*, a rod-like stem or leaf-rhachis, iv. 39 : " Dodrantaes aut maiores, gerit scapos, fusorum effigie, quasi minutulis foliis circumdatos."

*scōbis*, lit. (1) sawdust, i. 100 : " Ramenta scobemque potu, perniciem afferre tradunt " ; hence (2) dust from worm-eaten wood, i. 79 : " Adulteratur ligni scobe quam vermiculi erodentes excuserunt."

*scrōbis*, (1) a ditch, iv. 49 : " In riguis et scrobibus nascitur " ; iv. 92 ; (2) a trench, iv. 159, 182 : " Alii scrobes in terra concamerato sinu fodiunt."

*scūtulum*, lit. a small shield, a term applied to the placenta of *Hyoscyamus*, iv. 72 : " scutulis septi seminum plenis."

*sēdāre*, to allay, soothe, iv. 108 : " Trita dolores in artubus, astrictius vinctis illitu sedat " ; v. 4.

*sĕgĕs*, lit. (1) a cornfield, iv. 42 : " Nascitur in saepibus, vinetis, maceriis, et segetibus " ; hence (2) growing corn, esp. wheat, ii. 110 : " Lolium . . . inter segetes nascitur " ; iii. 147 : " Nascitur in segetibus et hordeis."

*segmen*, a shred, cut piece, ii. 190 : " His scillae segminibus ad oleum, vinum, aut acetum scillinum utimur."

*sĕmen*, lit. (1) seed (coll.), e.g. of *Chelidonium majus*, ii. 200 ; *Nigella sativa*, iii. 92 : " Quibus semen includitur nigrum, acre, odoratum, quod panibus inspargitur " ; *Saponaria Ocimoides*, iv. 31 ; *Papaver Rhoeas*, iv. 67 ; *Papaver somniferum*, iv. 68 : " E sativi genere, quoddam hortensium est, cuius semen in panem densatur " ; *Glaucium*, iv. 69 ; hence (2) an individual seed, e.g. of *Papaver Rhoeas*, iv. 67 : " Semina acetabuli mensura ex aqua mulsa pota, alvum leniter emolliunt " ; (3) seed-like fruit (coll.), e.g. of *Cyperus rotundus*, i. 4 ; *Tragopogon*, ii. 160 ; *Atractylis gummifera*, iii. 9 ; *Opopanax hispidus*, iii. 53 ; *Sideritis* or other Labiate, iv. 36 ; (4) an individual seed-like fruit, e.g. the nutlet of *Echium*, iv. 30 : " Flores secundum folia purpureos, in quibus semina capiti viperarum similia insunt " ; the achene of *Urtica*, iv. 95 ; " Sylvestris asperior, latioribus nigrioribusque foliis, semine lini, sed minore " ; (5) small round fruit (coll.), e.g. of *Lawsonia inermis*, i. 126 ; and *Rhus coriaria*, i. 149 ; (6) an individual small round fruit, e.g. the capsule of *Anagallis arvensis* and *A. foemina*, ii. 198 ; and the berry of *Ruscus*, iv. 148 ; (7) the grain (caryopsis) of *Avena*, iv. 140 : " in summo capite semina bina ternave, rubra, quibus aristae, quasi capillaceae, exeunt " ; (8) the false fruit (receptacle enclosing two achenes) of *Agrimonia Eupatoria*, iv. 44 : " Semen medio caule erumpit, pilosum, deorsum spectans, quod siccatum vestibus inhaeret."

*sĕmis*, a half, i. 61 : " Tres librae cum semisse spissati olei assumuntur " ; i. 64.

*sĕmĭta*, a path, road, ii. 145, 173 ; iv. 96.

*sentĭre*, lit. (1) to perceive, discern, feel ; hence (2) to)undergo, i. 182 : " Stomacho inutilis est, et facile corruptionem senit " ; (3) to feel the effects of, ii. 119 : " Tabidis qui alimentum non sentiunt . . . convenit."

*sĕps*, a hedge, i. 122 ; ii. 173, 184 ; iv. 96.

*sĕpĭmentum*, a hedge, i. 122 : " Halimus frutex est sepimentis idoneus."

*sĕptum* (= *saeptum*), lit. (1) a fence ; hence (2) the diaphragm (med.) ; (3) a partition, e.g. the septum of the capsule of *Hyoscyamus*, iv. 72 : " scutulis septi seminum plenis."

*sĕrĕre*, lit. (1) to sow ; hence (2) to plant, iv. 137 : " Seritur gratia utilitatis pecorum."

*serrātus*, lit. (1) saw-like, serrate, e.g. the leaflets of *Sambucus Ebulus*, iv. 185 ; those of *Rhus Coriaria*, i. 149 ; the leaf-segments of *Agrimonia Eupatoria*, iv. 44 ; those of *Centaurea Centaurium*, iii. 7 ; the leaf-segments of *Adiantum Capillus-Veneris*, iv. 137 ; hence (2) jagged, incised, e.g. the leaves of *Glaucium flavum*, iv. 69.

*sebum* (= *sēbum*), hard animal fat, tallow, ii. 86: "Hircinum sebum, ovillum, cervinumque ita curato . . . Bubulum autem sebum renibus maxime detractum."

*sextārius*, the sixth part of a congius, approx. a pint, iv. 200.

*siliqua*, a pod, in a wide sense: (1) a legume, e.g. of the Carob tree, *Ceratonia Siliqua*, i. 160; of *Vicia*, ii. 165; *Glycyrrhiza* and *Lens*, iii. 6; *Securigera Coronilla*, iii. 147; (2) a siliqua, e.g. of *Condylocarpus laevigatus*, ii. 121; of *Sisymbrium polyceratum*, ii. 175; *Chelidonium majus*, ii. 200; (3) a follicle, e.g. of *Delphinium*, iii. 77; of *Paeonia*, iii. 158; *Cynanchum*, iv. 84; (4) a capsule, e.g. of *Peganum Harmala*, iii. 51; of *Hypericum*, iii. 172; *Iris*, iv. 25; *Hyoscyamus*, iv. 31, 72; *Saponaria Ocimoides*, iv. 31.

*sinere*, to allow, permit, iv. 73: "Fama est, si virens domum importetur, non sinere in ea pulices gigni."

*singultus*, a hiccup, iii. 5, 39.

*sistere*, to stop, check, i. 6: "Alvum potu sistit"; i. 115: "Tritum, potumque, stomachi ventrisque fluctiones sistit"; i. 123; ii. 115; v. 3, 5.

*sōlūtus*, lit. (1) loose; hence (2) relaxed, i. 135: "Spinae decoctum solutos artus fotu committit"; (3) feeble, weak, i. 15: "invalidi odoris, solutarumque virium."

*solvere*, to loosen, relax, i. 40: "Vis ei alvum solvere potu"; i. 160.

*sorbere*, to drink down, iv. 1: "Stomachicis eam manducare et succum devorare proderit, si postea dilutum vinum sorbeatur."

*sorbitio*, a potion, broth, gruel, ii. 86; iii. 93; iv. 142: "Coquitur cum hordeacea farina, sale et oleo in sorbitione"; iv. 151: "Datur per se ieiunis, et cum sesama, aut ptisanæ, succo, aut halicæ aut lentis cremore, cum aqua mulsa aut pulte, aut quavis alia sorbitione."—"Celsus uses the term 'sorbitio' for gruel," Wootton, ii. 299.

*spāctum intercēdens*, an internode, iv. 60.

*spāctum intervācans*, an internode, iv. 12: "Id caulem emittit . . . circa quem brevi intervācante spacio, folia exeunt angusta."

*spātha*, (1) a wooden spoon for stirring, spatula, i. 64, 184; ii. 86: "Et subditis levibus prunis spatha movetur"; (2) the spathe of a palm inflorescence, i. 152.

*spāthum intercēdens*, an internode, iii. 116.

*spēctes*, lit. (1) appearance, form, ii. 141: "De Sio Crateuas tradit, haerbam esse fruticis specie"; iv. 115: "Decoctaque lutei ovi speciem exhibet"; hence (2) a minor division in a classification, a particular kind, species, ii. 147, 148, 195.

*spīca*, lit. (1) a point; hence (2) an ear of corn, spike, iv. 46: "Folia habet hordei, sed breviora, et angustiora, spicam lolio similem"; (3) a spiciform inflorescence, e.g. of *Satureia Thymbra*, iii. 43.

*spīcūlum*, a fine prickle, iii. 5: "Aculeos et spicula extrahit."

*spīna*, lit. (1) a thorn, spine, prickle, pungent bristle, e.g. of



*Rubus idaeus*, iv. 41 ; of *Helminthia echinoides*, ii. 146 ; *Anchusa tinctoria*, iv. 26 ; hence (2) a thorny or prickly tree, shrub or herb, i. 135, 136 ; iii. 106 ; iv. 166.

*spīnūla*, a pungent bristle, e.g. of *Echium*, iv. 30.

*spīrācūlum*, an orifice, i. 4, 48, 67, 80, 184 ; *spīrācūlum cūtis*, a pore of the skin, i. 151 ; iii. 22 : " Cutis spiracula ut gummi obstruit."

*spissamentum*, an astringent used for thickening unguents so that they may retain scents better, i. 4 : " Malagmatis calfacientibus, et unguentorum spissamentis adiici solet " ; i. 5, 22, 23, 52, 64, 65, 67, 73, 74 : " Complurimum autem balanino oleo, aut omphacino, iuncus odoratus spissamenti gratia adiicitur " ; i. 152 ; iii. 5.

*spissandi vis*, astringent properties, i. 139 : " Salix vulgo nota est cuius semen, folia, cortex, et succus spissandi vim habent."

*spissus*, thick, close, dense, iv. 132 : " Quae [folia] juxta radicem spissiore flocco canescunt " ; thick in consistency, i. 91.

*sporta*, a plaited basket used for straining, ii. 111.

*sportūla*, a little basket for straining, i. 38, 53, 64.

*squalor*, roughness, dirtiness, i. 130 : " Maxime probatur odoratum, subviride . . . quod arenas non collegit, nec squallore obsitum est."

*squāmae ossium* (pl.), sequestra (med.), i. 22 ; iii. 5, 91.

*sternūtāmentum*, sneezing, i. 1 ; ii. 158 : " Naribus haustum subinde movet sternutamenta " ; ii. 194 ; iv. 151.

*stigma*, a brand, scar, ii. 194 ; iv. 79 : " Stigmata sine exulceratione delent, si quinis senisve diebus, sensim perfricentur."

*stillā*, a drop, i. 143.

*stillāre*, to exude, i. 143.

*stillicidium*, dripping, i. 2, 19, 111 ; iv. 147.

*stillus*, lit. (1) a stake or pointed implement ; hence (2) a stalk of a plant, whether stem or petiole, e.g. the petiole of *Calystegia Soldanella*, ii. 135.

*stīpūla* (dim. of *stīpēs*), the culm of a grass, ii. 104 : " Folio et stipula triticum imitatur."

*stōlo*, a short or subordinate shoot, ii. 201 (*Ranunculus Ficaria*) ; iii. 53, 77, 158.

*strūma*, a scrofulous swelling, i. 1 : " Quinetiam coctae et illitae, strumas, veteres duricias emolliunt " ; i. 185.

*suāvitas*, (1) sweetness, pleasantness, i. 64 : " Eligi oportet bonum, quod cum odoris suavitate nares feriat " ; (2) a bad rendering of ἡδυσμα which Sprengel translates as *odorum* (perfume) i. 73.

*subhirsūtus*, (1) villous, e.g. the legume of *Psoralea bituminosa*, iii. 121 ; (2) densely pubescent or finely tomentose, e.g. the indumentum of *Marrubium vulgare*, iii. 118.

*sūbīgēre*, lit. (1) to bring under, get under ; hence (2) to work, knead, i. 64, 79 ; ii. 115 : " Subactum vino, suffusos ictu oculos recreat."

*sūbruffus*, somewhat reddish, i. 31, 135 ; iv. 11.

*subuēnīre*, to assist, relieve, heal, i. 63, 101, 139 ; iv. 117, 164.

*succus*, juice, sap, latex, i. 183 : " Succus tenera arbore antequam fructum ferat eximitur " ; i. 184 : " Tam sylvestri quam sativae fici lacteus succus coaguli modo lac contrahit " ; iii. 99, 123 ; iv. 84 ; v. 1.

*suffimentum*, a substance used for fumigation, incense, i. 25, 78.

*suffire*, to burn for fumigation, i. 26.

*suffitio* (1) fumigation, burning as incense, i. 80 ; (2) (for *suffimentum*) incense, i. 19.

*suffitus*, fumigation, burning as incense, i. 5, 80, 86, 103.

*sūgillāta* (pl.), bruises, ii. 115, 123, 171, 178 ; iv. 194.

*sūgillātio*, a bruise, ii. 169, 179.

*sūmere*, gen. to take : (1) to take, consume (eat or drink), ii. 123 : " Summo tamen cibo sumi debet " ; v. 7 : " Attamen in secunda valetudine paucum aqua dilutum, innoxie sumitur " ; (2) to take (in compounding a medicine), i. 28 : " Sumitur cyperi dimidium sextarium. "

*sūpervacūus*, of no use or benefit, i. 143 ; ii. 182 ; iii. 8, 41 ; iv. 98, 179.

*surculācēus*, full of shoots or twigs, iii. 172 ; iv. 165.

*surculōsus*, (1) full of shoots or twigs, ii. 200 ; iii. 42, 174 ; iv. 190 ; (2) woody, i. 23 ; iv. 11 ; (3) straw-like, iv. 45.

*surculus*, (1) a young branch, shoot or twig, i. 37 : " Fit et oleum e pinguitudine surculorum oleae " ; iv. 184 : " Ex eo genere, quaedam in arborem assurgit, surculos spargens arundinaceos " ; (2) a rod-like twig of *Ficus Carica*, i. 184 ; (3) one of several stems from a root, i. 16 : " Eligenda autem quae ab una radice integros surculos emittunt " ; iii. 82 : " Surculos emittit a radice una sesquipedales " ; (4) peduncle of false capitulum of *Dipsacus*, iii. 12 ; of capitulum of *Achillea*, iv. 104 ; of umbel of *Thapsia*, iv. 159 ; ray of pleiochasium of *Euphorbia Lathvris*, iv. 177 ; (5) rhachis of inflorescence of *Polygonum Hydropiper*, ii. 178.

*suspīriōsus*, short of breath, asthmatic, i. 27, 28.

*suspīrium*, shortness of breath, asthma, iii. 5 : " Insuper singul-tibus, suspiriis . . . pota cum aqua singulariter auxiliatur. "

*sylvestris* (= *silvestris*), lit. (1) belonging to woods, growing in woods ; hence (2) wild, uncultivated, i. 140 : " Sylvestris oleae, quam aliqui oleastrum appellant, . . . folia astringunt " ; ii. 137, 153.

*sylvōsus* (= *silvōsus*), wooded, iii. 11 : " Nascitur in sylvos. "

*syncaerus* (= *sincērus*), (1) clean, pure (of smell), i. 1, 21 ; (2) clean, clear of dirt, i. 92 : " Optima est splendens, syncaera, laevis " ; iii. 22, 97 ; (3) pure, unadulterated, i. 79 ; iii. 53 : " Adulteratur ammoniaco aut caera. Sed syncaeri experimentum est, si digitis in aqua friatus resolvatur et lactescat. "

*tabella*, a small board, i. 39.

*tābes*, wasting away, consumption, decline, i. 90 : " Tussi ac tabi conveniunt per se aut in eclegmate ex melle " ; ii. 140 : " Contra tabem datur in potu. "

*tābitūdo*, wasting away, consumption, decline, i. 87 : " Pineae

nuces recenter arboribus decerptae in passo franguntur, et decoctae, vetustae tussi ac tabetudini conferunt."

*tābīdus*, lit. a wasting away, hence a consumptive, a person in a decline, ii. 119.

*tēgēs*, a mat, i. 77.

*tēgūmentum*, a covering, e.g. the spathe of a palm inflorescence, i. 152.

*tempērāre*, to prepare, i. 38, 43, 49, 54.

*tēner*, soft, tender, delicate, i. 10, 47, 109, 136, 184.

*tentāre*, to disturb, affect, i. 5; ii. 199; v. 3: "Alvum sistunt, sed vesicam et caput tentant."

*tentōrium*, lit. a tent, hence an arbour, pergola, iv. 146; "Hac smilace quadam topiariorum arte, tentoria contra aestus molestiam factitantur."

*tēnūis*, (1) narrow, i. 107: "Laurus quaedam tenui folio constat Altera latiore"; ii. 129; (2) slender, i. 3: "radicibus longis tenuibus" ii. 174.

*tēpens*, lukewarm, tepid, i. 111; ii. 194.

*tērēre*, to grind, triturate, iv. 168: "Aliqui capita ipsa et folia tundunt, et praelo exprimunt, terentesque in mortario, digerunt in pastillos."

*tērēs*, terete, iv. 181, 184.

*thymtāma*, incense, fragrant substance for burning, incense, i. 24, 26.

*tīnītus*, a ringing in the ears, i. 39, 40.

*tōmentum*, lit. (1) flock, stuffing for cushions, iii. 131; hence (2) a dense indumentum, e.g. the lanate indumentum of *Origanum Dictamnus*, iii. 35.

*tormīna*, colic, griping, i. 1, 122.

*torrēre*, to burn, i. 135.

*trāhēre*, to draw off, draw out, iv. 111.

*tritū* (p.p. of *tērēre*), ground, bruised, triturated, i. 3, 86, 144; ii. 187; iv. 9, 124; v. 1.

*tūber*, lit. (1) a swelling on the body of an animal; hence (2) a swelling on a plant, e.g. a tuber, ii. 139; iii. 5; a swollen node, iv. 6.

*tundēre*, to beat, pound, i. 1, 38, 39, 184; iv. 68, 139, 183.

*tūnica*, lit. (1) an undergarment, tunic; hence (2) the seed-coat (testa) of *Castanea*, i. 147; (3) the coat of a bulb, e.g. of *Urginea maritima*, ii. 190; of *Veratrum album*, iv. 151; (4) the cup of an acorn, i. 144.

*tussis*, a cough, i. 1, 31, 123, 184; iv. 68.

*tūsus* (p.p. of *tundēre*), pounded, bruised, crushed, i. 28, 29; iv. 163, 167, 175, 179.

*tyrsus* (= *thyrsus*), a stalk, stem, iv. 129.

*ūdus*, damp, moist, ii. 111: "Reliquum . . . confestim torreatur flagrantissimo in sole. Namque si paulisper udum maneat, acorem concipit."

*ulna*, lit. (1) the elbow; hence (2) a measure of 6 feet, iv. 77.

*umbella* (dim. of *umbra*), lit. (1) a sunshade ; hence (2) an umbel ii. 156 ; iii. 57, 58, 78, 81 ; iv. 82, 159 ; (3) a corymb, ii. 174 ; iii. 32 ; (4) a corymb of capitula, iii. 10 ; iv. 39, 60, 62 ; (5) the pleiochasium of *Sambucus nigra*, iv. 184 ; (6) a thyrses, iv. 92 ; (7) a spicate inflorescence, iii. 30.

*unguentarius*, an ointment maker and dealer, i. 152 ; iii. 147.

*unguis*, the claw of a rose petal, i. 52 : " totiesque recenteis rosas detractis unguibus immittito " ; i. 132.

*uva*, lit. (1) a grape ; hence (2) a bunch of grapes, i. 16 ; iii. 93 ; iv. 183 ; v. 2, 3 ; (3) a cluster of fruits of *Ricinus communis*, iv. 167 ; of *Bryonia dioica*, iv. 194 ; (4) a drupe of *Rhus coriaria*, ii. 117 ; (5) the uvula, i. 92 : " Tonsillarum et uvae inflammationes, anginaeque utiliter perunguntur " ; i. 148.

*vālens*, lit. (1) strong ; hence (2) healthy : " Oleum quod ex immaturis olivis exprimitur, ad multos usus recte valentibus accommodatissimum."

*valva*, a leaf of a folding door, i. 121 : " Fama est ramos huius valvis fenestrisve impositos, veneficia depellere."

*vārtius*, variegated, ii. 181 : " Folia habet haederae, purpurea, varia, in quibus susquedeque albicant maculae."

*vārus*, a skin eruption, pimple, i. 40 : " Simili modo fit balaninum oleum, quod repurgat maculas, lentigines, varos, et cicatrices nigras " ; i. 61, 77.

*vascūlum*, a small vessel, i. 61.

*vellere*, to pull up, i. 7 : " Exigue fruticat, et cum radice vellitur."

*vēna*, the urinary passage, i. 1, 4 : " Venarum spiracula laxat " ; i. 48, 67, 73 : " Itaque ora venarum aperit " ; i. 184.

*vendicare* (= *vindicare*), to claim, i. 34 : " Oleum quod sylvestres olivae fundunt, vehementer astringit, et ad sanorum usus secundum sibi locum vendicat."

*vēnōsus*, fibrous, i. 16.

*venter*, the bowels, i. 141.

*vēnus*, sexual desire, i. 90.

*vertebra*, lit. (1) a vertebra of the spine ; hence (2) the verticillaster of *Labiatae*, iv. 36 : " In quibus, per institia, orbiculatae vertebrae ut in Marrubio spectantur."

*vēsica*, the bladder, i. 3, 123 : " Vesicae calculos comminuit " ; i. 150, 184 : " Gutturi autem, arteriae, renibus, vesicae . . . aptissimae."

*vētus*, lit. (1) old (opp. to young) ; hence (2) old (opp. to new), of long standing, chronic, ii. 199 : " Et contra veteres capitis dolores, caput eo cum aceto et rosaceo perfundi utile est " ; iii. 7 : " Radix convenit . . . veteri tussi " ; iv. 63 : " Vulnere glutinant. Veteraque ex melle, ad cicatricem perducunt."

*vētustus*, old, of long standing, chronic, iv. 65 : " Vetustis ulceribus, sicca efficaciter inspargitur."

*vibex*, a weal, i. 61 : " Vibices cicatricesque celerrime ad colorem reducit, ita ut saepe fallant."

*vibrare*, lit. (1) to shake, agitate ; hence (2) to emit, exhale, i. 97 :

"Cuius probatio est ut purpurae modo splendeat, fitque grave, ac validum odorem vibret."

*villōsus*, clothed with fine hair-like roots, i. 10.

*vindicāre*, to protect, i. 149; iv. 116: "Vulnera recentia ab inflammatione vindicat."

*virens*, in the fresh or green state, i. 116: "Virentia folia tusa et imposita ignibus sacris medentur, et caeteris inflammationibus"; ii. 177: "Qua virente ad multa, perinde ad quae nos ruta, utuntur."

*virga*, a slender, rod-like or switch-like branch, iii. 38, 121 bis; iv. 105, 150: "Virgas emmittit cubitales singulari ramulo constantes"; iv. 160.

*viridis*, lit. (1) green (in colour); hence (2) green, fresh (opp. to dried), i. 159: "Cerasia ventri utilia sunt, si viridia sumantur"; i. 162: "Flos et viridis et siccus cataplasmatibus imponitur"; ii. 133; iv. 68, 116; (3) green, immature, i. 135: "succus expressus siccatur in umbra, niger ex maturo semine, subruffus ex viridi."

*vīrus*, lit. (1) a slimy liquid, slime; hence (2) venom, poison of snakes and other animals, i. 15: "Contra bestias quae virus eiacularantur, venenaque convenit"; iv. 27; (3) an unpleasant smell, i. 8, 13: "Damnatur candicans, scabra, hircinum virus redolens"; i. 83, 133; iv. 53, 164: "Caetera porrum imitatur, atque haer-baceum virus olet."

*vitiāre*, lit. (1) to injure, spoil, corrupt; hence (2) to adulterate, i. 21: "Sed varie vitiatur, misto ab aliquibus terebinthi, cypri, lentisci, balani unguento."

*viticūlus*, a slender switch-like or rod-like shoot, iv. 9, 13, 17, 84.

*vītiligo*, a cutaneous eruption, i. 108: "Vitilignes emaculant"; i. 157, 184; iii. 85.

*vitium*, lit. (1) a blemish, i. 1; hence (2) a defect, i. 6: "Medefactum vendi solet, quod vitium ex eo deprehenditur, quod candida sit spica et squalida, nulloque pulvere obsita"; (3) an injurious effect, i. 3: "Quae . . . praecusorum renum vesicaeque farctae vitia potu leniunt"; (4) an affection, complaint, disease, i. 6: "auxilantur . . . renum vitiis"; i. 7: "Item adversus lienem, renum et vesicae vitia, et venenatos ictus ex vino."

*vulsus* (p.p. of *vellere*), lit. (1) torn from, i. 140: "Cutem a capite vulsam conglutinant"; hence (2) suffering from spasms or convulsions, i. 2: "Prodest . . . torminibus, vulsis, ruptis"; i. 22.

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## XVIII—PRINCIPAL DECISIONS CONCERNING NOMENCLATURE MADE BY THE SIXTH INTERNATIONAL BOTANICAL CONGRESS. T. A. SPRAGUE.

The subject of nomenclature was discussed at three afternoon sessions of Section SYS at the Sixth International Botanical Congress, held at Amsterdam in September, 1935. The discussions were based on the "Synopsis of Proposals concerning Nomenclature" and "Preliminary Opinions concerning Nomenclature Proposals" which had been prepared by the writer in the capacity of Rapporteur général. Thanks to the excellent arrangements made by the Recorder, Prof. A. A. Pulle, and the tactful guidance of the President, Dr. E. D. Merrill, it was possible to complete the entire nomenclature programme during the three afternoons allotted to it, in spite of some of the discussions proving rather lengthier than had been anticipated. The Report of the Nomenclature Proceedings will appear in the first volume of the "Proceedings" of the Amsterdam Congress, and it will then fall to the Editorial Committee appointed at Amsterdam to prepare a supplement to the International Rules of Botanical Nomenclature. In the meantime it is thought that

the publication of the present summary of the principal nomenclature decisions at Amsterdam will be useful, especially to those botanists who were unable to attend the Congress.

1. General acceptance of the text of the International Rules of Botanical Nomenclature, ed. 3 (1935), as representing the decisions of the Fifth International Botanical Congress, Cambridge (1930).

2. Special acceptance of the date, Jan. 1, 1935, recommended (instead of Jan. 1, 1932) by the Editorial Committee of the International Rules, ed. 3 (1935) as the starting-point for obligatory Latin diagnoses of new groups of living plants (Bacteria excepted).—Syn. Prop. 29, Art. 38.

3. Addition to Art. 20 of a paragraph to the effect that the two volumes of Linnaeus, *Species Plantarum*, ed. 1 (1753) are treated as having been published simultaneously.—Syn. Prop. 16, Art. D 20.

4. Treatment of provisional names (*nomina provisoria*) as not validly published.—Prop. Brit. Bot. (1929), 16, Art. 44; Briq. Rec. Syn. 41, Art. 37 ter, amended wording, excluding the words "*seu eventuale*."

5. Treatment of alternative names (*nomina alternativa seu eventualia*) as validly published.—Example: The names *Cymbopogon Bequaerti* De Wild. and *Andropogon Bequaerti* De Wild., proposed simultaneously as alternative names for a new species described in Bull. Jard. Bot. Brux. 6, 8 (1919), are both treated as validly published.

6. Replacement of Art. 54, paragraph 2, by a paragraph to the following effect :—

"When, on transference to another genus, the specific epithet has been applied erroneously in its new position to a different plant, the new combination must be retained for the plant on which the epithet was originally based, and must be attributed to the author who first published it."—Syn. Prop. 39, Art. B 54, amended wording.

7. Textual amendment of Art. 60. The second sentence to read as follows :—

"The publication of an epithet in an illegitimate combination must not be taken into consideration for purposes of priority, except as indicated under Art. 61."—Syn. Prop. 46, Art. A 60 [This brings the text of Art 60 into conformity with Art. 61].

8. Addition to Art. 61 of a paragraph to the following effect :—

"When an author simultaneously publishes the same new name for more than one group, the first author who adopts one of them, or substitutes another name for one of them, must be followed."—

Prelim. Opin. 18, Art. A 61 [The same principle of selection is already embodied in Art. 56, where two or more names have been published simultaneously for the same group].

9. Addition to Art. 70 of a note to the following effect :—

Note 2 bis. "The liberty of correcting a name must be used with reserve, especially if the change affects the first syllable, and above all the first letter of the name."

"Example : The spelling of the generic name *Lespedeza* must not be altered, although it commemorates Vicente Manuel de Céspedes."—Syn. Prop. 52, Art. D 70 ; Rhodora, 36, 130–132, 390–392 (1934).

10. Rec. XLIII amended to read as follows :—

"Specific (or other) epithets should be written with a small initial letter, except those which are derived from names of persons (substantives or adjectives) or are taken from generic or vernacular names (substantives or adjectives)."

Additional examples : "*Schinus Molle* (Peruvian vernacular name), *Astrocaryum Tucuma* (Brazilian vernacular name)."—Syn. Prop. 55, Rec. B XLIII.

11. Art. 72, Section (1), to be replaced by the following : "A Greek or Latin word adopted as a generic name retains its classical gender. In cases where the classical gender varies, the author has the right of choice between the alternative genders. In doubtful cases, general usage should be followed.

"The following names, however, whose classical gender is masculine, are treated as feminine in accordance with historic usage : *Adonis*, *Orchis*, *Stachys*, *Diospyros*, *Strychnos*. *Hemerocallis* (m. in Sp. Pl.: Lat. and Gr. *hemerocalles* n.) is also treated as feminine in order to bring it into conformity with all other generic names ending in *-is*."—Syn. Prop. 58, Art. C. 72.

12. (a) Rejection of the principle of *Nomina specifica conservanda* by a majority of 208 : 61.—Syn. Prop. 18, Art. A 21, 21 bis.

(b) Appointment of a Special Committee to draw up a list of names of economic plants in accordance with the International Rules. This list may remain in use for a period of ten years.

13. A resolution was passed recommending the adoption by botanists of the standard-species (*species lectotypicae*) of Linnean generic names printed in International Rules, ed. 3, 139–143, unless there is clear reason for rejecting any species in favour of another. Any changes considered desirable should be communicated to the Secretary of the Special Committee for Phanerogamae and Pteridophyta, Miss M. L. Green, The Herbarium, Royal Botanic Gardens, Kew.



14. The list of Standard-Species of *Nomina Generica Conservanda* printed in International Rules, ed. 3, 143-146, was referred to the Special Committee for Phanerogamae and Pteridophyta.

15. The lists of *Nomina generica conservanda proposita* printed in International Rules, ed. 3, 118-138, Synopsis of Proposals, 66-73, and Preliminary Opinions, 25, were referred to the appropriate Special Committees appointed at Amsterdam.

16. Acceptance of the list of *Nomina familiarum conservanda* printed in Syn. Prop. 64-65.

17. The following four resolutions concerning *Algae* were adopted :

1. In describing new species of *Algae* special importance should be attached to the provision of illustrations and to maintenance of cultures of the species concerned.

2. The desirability of adopting further monographs as the starting-points of particular groups of *Algae*, as in the *Oedogoniaceae*, should be investigated.

3. A list of *Nomina dubia* of species, genera and families should be prepared, and also lists of *Nomina conservanda* and *rejicienda* of genera and families.

4. The desirability of retaining the Latin language for diagnoses of new *Algae* should be investigated.

18. All proposals concerning Mycology, submitted to the Amsterdam Congress, were referred to Subcommittees to be appointed by the Special Committee for *Fungi*.

19. Additions concerning Palaeobotany to be made to the rules and recommendations for the following objects :

1. To recognise as taxonomic groups, organ genera and artificial or form genera.

2. To ensure that the names originally given to detached organs or parts of plants shall only be used in their original signification, and shall not be employed in the designation of different organs, or of the plant as a whole.

3. To provide for the naming of an entire plant when it has been possible to reconstruct it by the association of its different organs.

4. To define how the names of the artificial genera are to be used.

5. To set up a permanent committee to consider the interpretation of the rules ; to adjudicate in cases of dispute or difficulty ; to draw up lists of *Nomina generica conservanda* ; and to make such further recommendations as may prove necessary, including rules for the determination of types.

20. Appointment of a Special Committee to report on the effects of the adoption of the proposed Art. A 19 and Appendix "IX," dealing with the rejection of certain works.—Syn. Prop. 15, 77-80.

## XIX—MISCELLANEOUS NOTES.

**RETIREMENT OF MR. DALLIMORE.**—William Dallimore, I.S.O., V.M.H., retired from the post of Keeper of the Museums on March 31st, having reached the age-limit after over 45 years' connexion with Kew.

Mr. Dallimore entered Kew as a student gardener on February 2nd, 1891. He was appointed Propagator in the Arboretum in 1892 and Assistant Curator (at that time called Foreman) in 1896. In 1908 he was transferred to the Museums as Assistant and became Keeper in 1926.

Mr. Dallimore's exceptionally wide knowledge of arboriculture has been of great service to Kew, especially in connexion with the planning and administration of the National Pinetum at Bedgebury, which he will continue to supervise during his retirement. His numerous friends will wish him many years of happy and useful activity.

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**DR. J. HUTCHINSON.**—John Hutchinson, LL.D., F.L.S., Botanist in the Herbarium, Royal Botanic Gardens, Kew, has been appointed by the Minister of Agriculture and Fisheries to be Keeper of the Museums in succession to Mr. Dallimore.

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**MR. H. K. AIRY-SHAW.**—Herbert Kenneth Airy-Shaw, B.A., Assistant Botanist in the Herbarium, Royal Botanic Gardens, Kew, has been appointed by the Minister of Agriculture and Fisheries to the post of Botanist as from April 1st, 1936.

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**CHARLES G. MATTHEW.**—Surgeon-Captain Charles Geekie Matthew, M.B., C.M. died from heart-failure on January 11th, after a short illness, at his home in Perthshire. Joining the Royal Naval Medical Service in 1889 he saw a great deal of service in eastern waters and spent a large part of his spare time in collecting ferns. He visited Japan, China and Malaya in 1903-4 while Staff-Surgeon on H.M.S. Eclipse, and again in 1906-7 on board H.M.S. Monmouth he visited Japan, China, Malaya, the Philippines and Honolulu. In 1908 he published privately a pamphlet of 35 pages entitled "Notes on the Ferns of Hong-Kong and the Adjacent Mainland." Matthew retired from the Service in 1909 but during the winters of 1911, 1912 and 1913 he returned to Malaya to continue his botanical collecting. During the War he served with the Dover Patrol and afterwards retired to Perthshire where he remained until his death.

His fern collections, amounting to 2,000 sheets, which are very complete and particularly well prepared, were presented by him to Kew in 1928.

F. BALLARD.

**Rock Garden Plants.\***—Mr. Clarence Elliot, whose extensive knowledge of rock plants and uncanny eye for a good species are well-known to all horticulturists, has written a volume in which

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\* By Clarence Elliot. Edward Arnold & Co., London, 1935. Pp. 328. Illustrated.

these characteristics are given full play and which will be warmly welcomed by all rock garden enthusiasts. It is illustrated by photographs, including one of Mr. Elliott's alpine lawn (a rock garden feature of his own invention), and by a beautiful coloured frontispiece of *Androsace strigilosa* by Barbara Elliott.

In the preface written in July, Mr. Elliott expresses the hope that the difficulty of the changing of well-known horticultural names will be met by the preparation of a list of such names to be used "for all time." This hope was partially met at the International Botanical Congress at Amsterdam, where it was decided to prepare a list of the *correct* names of well-known economic plants, to stand unchanged for ten years. This should go a long way towards mitigating the nuisance, to pure and applied botanists alike, of changes of well-known names necessitated by the Rules of Botanical Nomenclature.

**Hooker's Icones Plantarum.**†—The fourth part of vol. 3 of the Fifth Series, published in December 1935, is of exceptional interest. It includes double plates of three distinct tree *Senecios* from Kilimanjaro, namely *Senecio Johnstoni* (t. 3288), *S. kilimanjari* (t. 3289) and *S. Cottonii* (t. 3290), all of which passed for many years under the name *S. Johnstoni*.

A fourth double plate (t. 3295) is devoted to a new genus *Hintonia* (*Rubiaceae*—*Condamineae*), comprising four species referred previously either to the related genus *Portlandia* P. Br. or to *Coutarea* Aubl. (*Cinchoneae*). All are natives of Mexico or Guatemala. *Bouvardia capitata* and *B. cataphyllaris* (tt. 3296, 3297) are new species discovered during the last few years by Mr. G. B. Hinton in the Temascaltepec district of Mexico. *Basanacantha echinocarpa* (t. 3298), originally described under the name *Randia echinocarpa* by Sessé and Mocino, is now adequately figured for the first time from abundant material collected by Mr. Hinton in the States of Mexico and Guerrero, where the shrub is known by the vernacular name "Cirian Chino." The globose fruits, densely covered with "emergences" of different sizes and shapes, have a fantastic appearance suggesting galls or small witches' brooms. The seed, which is imbedded in pulp, is edible, while the shell of the fruit is used medicinally.

*Gentiana salpinx* (t. 3299) is a remarkable species of the section *Pneumonanthe*, with handsome red tubular flowers and exserted anthers. Originally collected by Ehrenberg in the Temascaltepec district of Mexico in 1831, it was rediscovered in the same area just a century later by Mr. G. B. Hinton, who has found it in several different localities. Equally of interest from another point

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† "Hooker's Icones Plantarum or figures, with descriptive characters and remarks, of new and rare plants selected from the Kew Herbarium." Fifth Series. Edited for the Bentham Trustees by Sir A. W. Hill, K.C.M.G., Sc.D., F.R.S., Director, Royal Botanic Gardens, Kew; Honorary Fellow, Kings College, Cambridge. Vol. 3, Part 4 (London, Dulau & Co., 1935). Price 10s.

of view is *Cephaelis potaroënsis* (t. 3300), a shrub with groups of three white flowers subtended by vivid orange bracts, apparently confined to the valley of the Potaro River in British Guiana. Few travellers have failed to notice it, and dried specimens have been accumulating for many years, but it was not until the large blue fruits were collected by Mr. T. G. Tutin in 1933, that it was possible to assign the shrub to any known genus and to describe it as a new species. It and the related *Cephaelis Duckei* from the Amazons region may possibly constitute a new subgenus of *Cephaelis* or even an independent genus. Another new tropical American species is *Cuphea Hintoni* (t. 3294), which together with *C. avigera* Robins. et Seaton forms the basis of a new section *Ornithocuphea* (Koehne) Bullock. This section is characterized by the possession of a long straight ascending spur-like "disk," which owing to being adnate to the calyx in its lower half has been previously overlooked.

The Balkan peninsula is represented by five plates, the most outstanding depicting *Brachypodium serpentini*, a new species discovered on serpentine rocks in Albania by Messrs. Alston and Sandwith in 1933, and of which additional material including mature caryopses was obtained by them in 1935. In vegetative characters *B. serpentini* bears a distinct resemblance to certain species of *Festuca*, more especially those of sect. *Variae* Hack., the caespitose habit, the anatomical structure of the leaf-blade, and the entire sheaths of the innovations being characters often met with in *Festuca*. The inflorescence, on the other hand, is that of a typical *Brachypodium*, and the caryopses possess the same elongated linear hilum, while the starch grains are simple and rounded and thus characteristic of the subtribe *Brachypodinae*. The new species is made the type of a proposed new section *Brachypodium* sect. *Festucopsis*.

The other Balkan species are mainly of phytogeographic interest. *Geranium aristatum* (t. 3276) has a somewhat limited distribution from Thessaly to the southern parts of Albania. *Cephalorrhynchus glandulosus* (t. 3277), one of the *Compositae-Cichorieae*, has a remarkable discontinuous distribution: originally described from Asia Minor, it has since been discovered in Albania and Banat. *Solenanthus scardicus* (t. 3278), one of the *Boraginaceae-Borageae*, is another of Messrs. Alston and Sandwith's discoveries in Albania. It was originally found by Bornmüller in N. Macedonia. *Allium Bornmuelleri* Hayek (t. 3279) is figured from material gathered in South (Greek) Macedonia by Alston and Sandwith. This may possibly be specifically distinct from the plants from North (Serbian) Macedonia to which the name *Allium Bornmuelleri* was originally given.

Four plates are devoted to Australian grasses. Under t. 3283, *Heterachne abortiva*, there is given a key to and an enumeration of the three species and one variety now recognized, one new species, *H. Baileyi*, being described. The genera *Heterachne* and *Ectrosia*, which were placed by Hackel in the tribe *Festuceae*, are now transferred to the *Eragrostae*. In Australia the species of *Iseilema*

(tt. 3284-3286) are collectively known as "Flinders Grass," but they have also been called "Landsborough Grass." From an economic point of view, they are exceedingly valuable to sheep- and stock-owners in the drier and warmer parts of the Australian continent. Under t. 3286 is given a key to and an enumeration of the nine Australian species of *Iseilema*, six of which are described for the first time.

The remaining plants figured include *Costera cyclophylla* (Ericaceae-Thibaudieae) from Sarawak (t. 3281); *Jasminum pellucidum* (t. 3282), a new species, first collected in Sarawak by Hose, and subsequently found there in other localities by Mr. P. W. Richards and by Mr. and Mrs. Clemens; *Asplenium paucijugum* (t. 3287), a new species, segregated from *A. longicauda* Hook., and recorded over a wide area from French Guinea, the Ivory Coast, Gold Coast and St. Thomas, to Uganda, Tanganyika Territory and Madagascar; and three related species of *Barleria* (Acanthaceae) from Tropical Africa, namely, *B. tetraglochis* (t. 3291), a new species from the Anglo-Egyptian Sudan, originally discovered by Major Aylmer and figured from material collected by Mr. J. E. Dandy, *B. proxima* Lindau (t. 3292), from Abyssinia and British Somaliland, figured from material collected by Mr. J. B. Gillett, and *B. quadrispina* Lindau (t. 3293), from the same area, also collected by Mr. Gillett.

**Botanical Magazine.**—The final part (part 4) of vol. 158 was published on Nov. 25th and contains the dedication to Sir William Wright Smith, together with his portrait. The following plants are figured: *Rhododendron Prattii* Franch. (t.9414), a fine white-flowered member of the *Adenogynum* subseries of *Taliense* from Szechwan; *Gurania malacophylla* Barb. Rodr. (t.9415), from the Upper Amazons, the female flowers—the male flowers having been figured previously (t.8085); *Gentiana ornata* Wall. ex Griseb. (t.9416), a native of Nepal; *Myrtus obcordata* (Raoul) Hook. f. (t.9417), one of the three species of this genus occurring in New Zealand; it hybridises freely with *M. bullata* Soland. ex A. Cunn (t.4809); *Pelexia maculata* Rolfe (t.9418), described from a cultivated plant probably from Venezuela; *Rhododendron mallotum* Balf. f. & Ward (t.9419), native of Upper Burma and Western Yunnan; *Ornithogalum montanum* Cyr. ex Ten. var. *platyphyllum* Boiss. (t.9420), from Syria, Iraq and Persia; *Coleus Frederici* G. Taylor (t.9421) a fine blue *Coleus*, formerly placed in a new genus *Neomullera* by Briquet, from Angola; *Leycesteria crocothyrsos* Airy Shaw (t.9422), a yellow-flowered species introduced by Kingdon Ward from Upper Assam, where it is known only in one locality; *Prunus cornuta* (Wall. ex Royle) Steudel (t.9433), a native of the Western Himalaya, and *Aconitum Forrestii* Stapf (t.9424), a handsome species apparently confined to the Lichiang Range in S.W. Yunnan, China.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 3, 1936 ROYAL BOTANIC GARDENS, KEW

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## XX—A LIST OF TRUE AND FALSE MAHOGANIES. R. MELVILLE.

The first accounts of mahogany were given by early explorers shortly after the discovery of America. The value of the wood for repairing ships was soon appreciated, Cortez using it for this purpose in 1521 and Sir Walter Raleigh in 1597. The timber did not reach Great Britain until much later. In 1724 a small quantity was received by Dr. Gibbons of Covent Garden, who had a candle-box made of the wood. This was much admired by the Duchess of Buckingham and under her patronage the wood quickly became fashionable. By 1750 Chippendale was making great use of it and especially of the beautifully figured pieces from crotches.

Up to the year 1845 the trade in mahogany was restricted by the imposition of heavy import duties. Following their removal, the wood gradually took its place as the most popular in the Victorian age for furniture and cabinet making. By 1880 the demand had outstripped the supply and efforts were being made to introduce the tree to a number of tropical stations in the Empire. Kew played an important part in this work by acting as a distributing centre for seeds. Many of the plantations were successful, especially those of *Swietenia macrophylla* in India. While the work of planting was in progress a search for substitutes was made which resulted by 1890 in the importation of considerable quantities of "mahogany" from West Africa. Much of this timber was the product of species of *Khaya* and *Entandrophragma*, closely related botanically to the true mahoganies. The introduction of new substitutes for mahogany has continued with unabated activity up to the present day and their identification now presents a difficult problem to all interested in timbers.

In the following list the true mahoganies are enumerated, followed by nearly 200 species which have been described as mahogany, with or without qualification. These are arranged, first under their families, 35 of which are represented from all parts of the tropic and temperate zones, and then in alphabetical sequence of the common names. Synonyms are included only if they have been used in the works consulted, and are placed in brackets below the accepted names. A few common names in frequent use have been included in addition to the mahogany names, but the list is not exhaustive in this respect. The sources of information are indicated by arabic numerals referring to the bibliography. In the list of com-

mon names, roman numerals refer to the families in the systematic section. Species represented by a wood specimen in the Museums of Economic Botany at Kew are distinguished by an asterisk.

### THE TRUE MAHOGANIES (MELIACEAE)

- \**Swietenia Mahagoni* Jacq. Spanish Mahogany. W. Indies. 16.
- \**S. macrophylla* King. Honduras Mahogany. C. America. 16.
- S. Candollei* Pittier. Venezuelan Mahogany. Venezuela. 16.
- \**S. humilis* Zucc. Mexican Mahogany. Mexico. 16.  
(*S. cirrhata* Blake). Mahogany. Mexico. 16.
- S. Krukovii* Gleason. Mahogany. Brazil. 5a.

### FALSE MAHOGANIES

#### I. DILLENIACEAE

- \**Curatella americana* L. Acajou Bâtard (Bastard Mahogany). French Guiana. 14.

#### II. FLACOURTIACEAE

- \**Kiggelaria africana* L. Natal Mahogany. Natal. 19.  
(*K. Dregeana* Turcz.)

#### III. VOCHYSIACEAE

- \**Vochysia hondurensis* Sprague. White Mahogany. British Honduras. 14.

#### IV. GUTTIFERAE

- \**Calophyllum Inophyllum* L. Borneo Mahogany. Alexandrian Laurel. India, Burma. 13, 24.
- C. antillanum* Britton. Chijole Mahogany. Tropical America.  
\*(*C. Calaba* Jacq.). Santa Maria Mahogany. 13, 15, 24.
- \**C. Calaba* L. Fiji Mahogany. Fiji, Ceylon.  
(*C. Burmanni* Wight). 14.
- \**C. spectabile* Willd. Fiji Mahogany. Fiji, Burma. 14.
- \**C. tomentosum* Wight. Satin Mahogany, Poon. India, Ceylon. 20.
- C. costatum* F. M. Bailey. Satin Mahogany, Red Touriga. Queensland. 20.
- C. australianum* F. v. M. Satin Mahogany, Red Touriga. Queensland. 20.
- C. Touriga* C. T. White & Francis. Satin Mahogany, Brown Touriga. Queensland. 20.
- \**C. brasiliense* Camb. Mahogany, Jacariuba. Brazil. 13.
- Ochrocarpus africanus* Oliv. Bastard Mahogany. Liberia. 14, 23.
- Garcinia sp.* Mahogany. Liberia. 23.

#### V. THEACEAE

- Caraipa grandiflora* Mart. Mahogany. Brazil. 13.

#### VI. DIPTEROCARPACEAE

- \**Shorea robusta* Gaertn.f. E. Indian Mahogany, Sal. India. 7, 3.
- S. polysperma* (Blanco) Merr. Bataan Mahogany. Philippine Is. 13, 14, 24, 18.
- S. negrosensis* Foxw. Philippine Mahogany, Red Lauan. Philippine Is. 13, 14, 18, 24.
- S. Curtisii* Dyer. E. Indian Mahogany, Seraya. Malay, Borneo. 7.

*Dipterocarpus* sp. Philippine Mahogany, Apitong. Philippine Is. Malay. 7.

#### VII. MALVACEAE

\**Hibiscus elatus* Sw. Blue Mahogany, Blue Mahoe. West Indies. 15.

#### VIII. STERCULIACEAE

*Tarrietia sylvatica* (Vid.) Merr. Philippine Mahogany. Philippine Is. Cochin China. 13, 24.

*T. javanica* Blume. Philippine Mahogany. Philippine Is. Cochin China. 13, 24.

(*T. cochinchinensis* Pierre). Acajou du Gamboge. 14.

\**T. utilis* Sprague. African Mahogany. Gold Coast, Liberia. 9, 14.  
(*Cola proteiformis* A. Chev.) Acajou résineux (Resinous Mahogany). Ivory Coast. 14.

*Cola cauliflora* Mast. Cola Mahogany. Nigeria. 23.

#### IX. TILIACEAE

\**Pentace burmanica* Kurz. Burma Mahogany, Thitka. Burma. 11, 7, 24.

*P. Griffithii* King. Burma Mahogany. Burma. 7.

*Cistantherapap averifera* A. Chev. False Hill Mahogany. Nigeria. 23.

#### X. HUMIRIACEAE

\**Saccoglottis gabonensis* Urban. Mahogany. Liberia. 14, 23.

(*Aubrya gabonensis* Baill.) Brass Mahogany Bark Tree. Nigeria. 6, 23.

#### XI. SIMARUBACEAE

\**Simaruba amara* Aubl. Acajou Blanc. (White Mahogany). Guadeloupe. 14.

\**Irvingia gabonensis* Baill. Duika Mahogany (possibly). Cameroons. 23.

(*I. Barteri* Hook.f.)

#### XII. BURSERACEAE

*Canarium Mansfeldianum* Engl. Edjun Mahogany. Nigeria. 23, 24.

*C. Schweinfurthii* Engl. Gaboon Mahogany. Nigeria, C. Africa. 14, 23.

*C. euphyllum* Kurz. Indian White Mahogany, White Dhup. Andaman Is. 4, 11, 14.

*Santiriopsis Klaineana* Pierre. White Mahogany. Nigeria. 13, 24.

\**Aucoumea Klaineana* Pierre. Gaboon Mahogany, Okoumé. Gaboon. 7, 24.

(“*Boswellia Klaineana*”). Libreville Mahogany. 13.

\**Protium altissimum* March. Mahogany, White Cedar. Guiana. 3.

#### XIII. MELIACEAE

\**Entandrophragma Candollei* Harms. African—, Scented Mahogany. Tropical W. Africa. 13, 23.

(*E. ferrugineum* A. Chev.). 23.

\**E. utile* Sprague. African—, Cedar Mahogany, Sapeli. Tropical W. Africa. 14, 23.

(*Pseudocedrela utilis* Dawe & Sprague). 13.

*E. macrophyllum* A. Chev. African—, White Mahogany, Tiama. Trop. Africa. 14, 23.



- \**E. cylindricum* Sprague. Cedar Mahogany, Penkwa. Trop. W. Africa. 14, 23.  
(*E. rufum* A. Chev.). 23, 24.  
(*Pseudocedrela cylindrica* Sprague). 13.
- \**E. septentrionale* A. Chev. Brown Mahogany. Gold Coast. 14, 23.
- E. excelsum* Sprague. W. African Mahogany. Trop. W. Africa. 24.  
(*Pseudocedrela excelsa* Dawe and Sprague). 13.
- E. caudatum* Sprague. African Mahogany. Trop. W. Africa. 23, 24.  
(*Pseudocedrela caudata* Sprague).
- E. Pierrei* A. Chev. Gaboon Mahogany, Obega. Gaboon. 14, 24.
- E. Rederi* Harms. Cameroon Mahogany. Cameroons. 14, 23.
- E. Bussei* Harms. Mboloh Mahogany. W. Africa. 24.
- E. angolense* (Welw.) C. DC. Quibaba da Queta Mahogany. Angola. 13, 14.  
(*Swietenia angolensis* Welw.).
- E. tomentosum* A. Chev. Acajou Aboudikro (Aboudikro Mahogany). Ivory Coast. 14.
- Pseudocedrela Kotschyi* Harms. Hard Cedar Mahogany. French Sudan, Nigeria. 13, 14, 23.
- \**Khaya senegalensis* A. Juss. Benin-, Togo-, African Mahogany. Sudan, Uganda. 7, 23, 24.  
(*K. Kerstingii* Engl.). Cameroons. 24.
- \**K. anthotheca* C.DC. Gaboon-, White Mahogany. Nigeria, Ivory Coast. 13, 23, 24.  
(*K. agboënsis* A. Chev.). Acajou Blanc. Ivory Coast. 14.  
(*K. euryphylla* Harms). 13, 23, 24.
- \**K. ivorensis* A. Chev. Red-, Lagos-, Grand Bassam-, African Mahogany. Ivory Coast to Gaboon. 23, 24.  
(*K. Klainei* Pierre ex Pell.). 13, 23, 24.
- K. grandifoliola* C.DC. Benin-, Big Leaf Mahogany. Fr. Guinea to E. Sudan.  
(*K. grandifolia* Stapf). 23, 24.  
(*K. grandis* Stapf). 13, 23, 24.  
(*K. Punchii* Stapf). 13, 23, 24.
- K. caudata* Stapf. African Mahogany. Gold Coast. 14, 23.
- K. madagascariensis* Jum. & Perrier. Madagascar Mahogany. Madagascar. 24.
- \**K. nyasica* Stapf. Rhodesian Mahogany. Rhodesia, C. Africa. 14.
- Guarea Thompsonii* Sprague & Hutch. Bossé-, Cedar-, Scented Mahogany. S. Nigeria, Gold Coast. 6, 14, 23.
- \**Guarea glabra* Vahl. Acajou (Mahogany). S. America. Mus. Kew.
- G. cedrata* Pellegr. Bossé-, Pink Mahogany. Ivory Coast. 14.
- G. africana* Welw. Satin Mahogany. Liberia. 14, 23.
- G. glomerulata* Harms. Scented Mahogany. Cameroons, Nigeria. 14, 23.
- Cabralea* sp. Bastard Mahogany. Brazil. 24.
- Trichilia Prieuriana* A. Juss. Benin-, Lagos Mahogany. Cape Verde to Congo. 13.
- \**T. emetica* Vahl. Natal-, Cape Mahogany. Trop. Africa. 3, 6, 14.

- \**Lovoa Klaineana* Pierre. Brown Mahogany, African Walnut. Gold Coast, Nigeria. 14.
- \**L. Swynnertonii* E. G. Baker. Brown Mahogany. C. Africa. 14.
- \**Cedrela odorata* L. Indian Mahogany, Cedar. Cuba. 13, 24.
- \**C. Toona* Roxb. Australian Mahogany, Red Cedar. India, Australia. 3, 13.  
     (*Toona ciliata* Roem.) 14, 24.  
     (*C. australis* F.v.M). Australian Mahogany, Red Cedar. Australia. 3.  
     (*Toona australis* (F.v.M.) Harms). 24.
- C. serrata* Royle. Australian Mahogany. India, Ceylon. 3.  
     (*Toona serrata* Roem.) 14.
- \**C. fissilis* Vell. Acajou Wood (Mahogany Wood). Brazil.
- C. guianensis* A. Juss. Acajou de Cayenne (Cayenne Mahogany). Fr. Guiana. 14.
- \**C. sinensis* A. Juss.  
     (*Toona sinensis* Roem.). Acajou de Chine (Chinese Mahogany). E. Asia. 14.
- \**Carapa guianensis* Aubl. Demerara-, Brazilian Mahogany. British Guiana. 13, 14, 23.
- \**C. procera* DC. Brazilian Mahogany. W. Africa, W. Indies, Guiana. 14, 23, 24.  
     (*C. Gogo* A. Chev.). Gogo Mahogany, African Mahogany. 14, 24.  
     (*C. velutina* C.DC.). Gogo Mahogany, African Mahogany. 24.  
     (*C. guyanensis* Oliv.)  
     (*C. guineensis* G. Don).
- C. surinamensis* Miq. British Guiana Mahogany. Surinam. 14.
- C. sp.* (*Xylocarpus* sp.). African Mahogany. E. Africa. 14.
- Ptaeroxylon obliquum* (Thunb.) Radlk. Cape Mahogany, S. Africa. 14, 24.
- Chuckrasia tabularis* A. Juss. E. Indian Mahogany. Chittagong Wood. India, Burma. 24.
- Melia composita* Willd. Indian Mahogany. India. 13, 24.
- \**M. Azedarach* L. Acajou Rose du Tonkin (Tonkin Rose Mahogany). Indo-China. 14.
- M. dubia* Cav. Ceylon Mahogany, Lunumidella. Ceylon. 19a.
- \**Synoum glandulosum* A. Juss. Australian-, Scrub Mahogany. Queensland, N.S.W. 24.
- Aglaia gigantea* Pellegr. Annam Mahogany. Annam. 14.
- \**Dysoxylum Fraserianum* Benth. Rose-, Australian Mahogany. Australia. 13, 24.  
     (*D. Lessertianum* Benth.). Rose Mahogany. 3.
- \**D. Muelleri* Benth. Miva Mahogany, Red Bean. Queensland. 20.
- D. cerebriforme* F. M. Bailey. Miva Mahogany. Queensland. 20.
- D. Pettigrewianum* F. M. Bailey. Spur-, Rose Mahogany. Queensland. 20.
- \**D. spectabile* Hook.f. New Zealand Mahogany. New Zealand. 14.
- \**Soyimida febrifuga* A. Juss. E. Indian Mahogany. Ceylon. 7, 13, 24.

#### XIV. RHAMNACEAE

*Zizyphus vulgaris* Lamk. Acajou d'Afrique (African Mahogany).  
Tunis. 14.

#### XV. ANACARDIACEAE

*Rhus integrifolia* (Nutt.) Benth. & Hook.f. Mahogany, W. Sumach.  
California. 13.

*Anacardium Rhinocarpus* DC. Panama Mahogany. Central and S.  
America. 13, 14, 15.

\**A. occidentale* L. Acajou (Mahogany). S. America. 14.

*Mosquitoxylum jamaicense* Krug. & Urb. Wild Mahogany. British  
Honduras. 14.

*Melanorrhoea laccifera* Pierre. Mahogany. Indo-China. 14.

*M. Maingayi* Hook.f. Straits Mahogany. Malaya, Sunda. 14.

*Oncocarpus vitiensis* A. Gray.

(*Semecarpus atra* Vieill.). Acajou Blanc (White Mahogany).  
New Caledonia. 14.

*Antrocaryon Klaineaenum* Pierre. White Mahogany. Cameroons. 14.

*Lannea Welwitschii* Engl. Acajou Magona (Magona Mahogany).  
Cameroons. 14.

#### XVIa. LEGUMINOSAE : PAPILIONACEAE

\**Pterocarpus indicus* Willd. Indian-, Philippine Mahogany, Padouk.  
India, Malay. 13, 24.

\**P. dalbergioides* Roxb. Tenasserim-, E. Indian Mahogany. E.  
Indies. 7, 13.

*P. macrocarpus* Kurz. Tenasserim Mahogany. Burma. 14.

\**Swartzia tomentosa* DC. Horseflesh Mahogany. S. America. 13, 24.

*Lonchocarpus laxiflorus* Guill. & Perr. African Mahogany. Nigeria.  
23.

*L. sp.* (probably *Peltophorum sp.*) Mountain Mahogany. Sierra  
Leone. 23.

#### XVIb. LEGUMINOSAE : CAESALPINIEAE

\**Afzelia africana* Smith. African Mahogany, Aligna. Nigeria. 13, 23,  
24.

*A. bracteata* T. Vogel. Konta Mahogany, Aligna. Liberia. 13, 23, 24.

\**A. quanzensis* Welw. Rhodesian Mahogany. Rhodesia. 6, 14.

*Brachystegia eurycoma* Harms. Mahogany. Nigeria. 2.

\**Detarium senegalense* Gmelin. Detarr Mahogany. Trop. W. Africa.  
6, 13, 23.

"*D. guineense*." Hard Mahogany. Cameroons. 23.

*Didelotia africana* Baill. Mahogany. S. Nigeria. 2.

\**Copaifera coleosperma* Benth. Rhodesian Mahogany. S. Rhodesia.  
14.

*Dialium Staudtii* Harms. Mahogany. Nigeria. 2.

*Poeppigia excelsa* A. Rich. Mahogany, Abey. San Domingo. 7.

\**Gymnocladus dioica* Koch. Mahogany, Coffee Tree Mahogany. N.  
America. 13, 24.

*Bauhinia candicans* Benth. Caoba Falsa (False Mahogany). Argentine  
14.

*Caesalpinia sp.* Horseflesh Mahogany. W. Indies. 14, 24.

*Peltophorum adnatum* Griseb. Horseflesh Mahogany. W. Indies. 15.  
*Daniellia caudata* Craib. Mahogany. Nigeria. 23.  
 \**Tamarindus indica* L. Madiera Mahogany. W. Indies, Florida. 13.  
*Erythrophleum* sp. Iron Mahogany. Australia. 14.  
 \**Hymenaea Courbaril* L. Mahogany. S. America. 3.  
*Gossweilerodendron balsamiferum* Harms. Pink Mahogany. Nigeria, Congo. 14.

#### XVIC. LEGUMINOSAE : MIMOSEAE

\**Piptadenia africana* Hook.f. White Mahogany. Trop. W. Africa. 24.  
*Enterolobium cyclocarpum* Griseb. Juana Costa Mahogany. Trop. America 14.  
*Acacia Koa* A.Gray. Mahogany. Philippine Is. 3.  
 \**Lysiloma Sabicu* Benth. Cuba Mahogany, Sabicu. W. Indies. 3, 13, 15.  
*Pithecellobium arboreum* (L.) Urb. Cuba Mahogany, Sabicu. W. Indies. 13.  
*Plathymenia reticulata* Benth. Brazilian-, Yellow Mahogany. Brazil. 14, 15.  
*P. foliolosa* Benth. Brazilian-, Yellow Mahogany. Brazil. 14.  
 (*P. foliosa* Benth.). 14.  
*Wallaceodendron celebicum* Koord. Derham Mahogany. Philippine Is. 14, 15.

#### XVII. ROSACEAE

\**Cercocarpus ledifolius* Nutt. Bay-, Mountain Mahogany. U.S.A. 13, 14, 17.  
 \**C. parvifolius* Nutt. Valley-, Mountain Mahogany. U.S.A. 13, 14, 17.  
 \**Parinari robusta* Oliv. Benin Mahogany, Mahogany Nut. Nigeria. 23.  
 \**P. gabunensis* Engl. Mahogany Nut. Nigeria. 23.  
*P. sp.* Red Mahogany, Pauwilli. Nigeria. 23.

#### XVIII. COMBRETACEAE

*Terminalia superba* Engl. & Diels. Yellow Mahogany, Shinglewood. W. Africa. 14.

#### XIX. MYRTACEAE

\**Eucalyptus botryoides* Sm. Bastard-, Swamp Mahogany. Victoria, N.S.W. 12, 13.  
 \**E. resinifera* Sm. Red-, Forest Mahogany. N.S.W., Queensland. 13, 20.  
 (\**E. hemilampra* F. v. M.). 1.  
 \**E. microcorys* F. v. M. Red Mahogany, Tallow Wood. N.S.W., Queensland. 13, 20.  
*E. robusta* Sm. White-, Swamp Mahogany. N.S.W., Queensland. 13, 20.  
 \**E. acmenioides* Schauer. White Mahogany, Yellow Stringybark. N.S.W., Queensland. 3, 12.  
 \**E. marginata* Sm. Bastard Mahogany, Jarrah. W. Australia. 5, 12.  
*E. Kirtoniana* F. v. M. Red Mahogany, Red Irongum. N.S.W., Queensland. 12.  
 (\**E. patentinervis* R. T. Baker). 1.

- E. umbra* R. T. Baker. White Mahogany. N.S.W. 1, 20.  
*E. diversicolor* F. v. M. Mahogany, Karri. W. Australia. 1, 12.  
*E. longifolia* Link & Otto. Mahogany, Woolly Butt. Victoria, N.S.W. 1, 12.  
*E. pellita* F. v. M. Mahogany, Woolly Butt. N.S.W., Queensland. 1, 12.  
*E. Consideniana* Maiden. White Mahogany. N.S.W. 12.  
*E. gomphocephala* DC. Red Mahogany. N.S.W. 12, 14.  
*E. polyanthemos* Schauer. Red Mahogany. N.S.W. 12.  
*\*E. pilularis* Smith var. *Muelleriana* (Hewitt) Maiden. White mahogany. N.S.W. 12.  
*\*E. obliqua* L'Hérit. White Mahogany. N.S.W. 12.  
*\*Tristania laurina* R. Br. Swamp Mahogany. Victoria, Queensland. 13, 24.  
*\*T. conferta* R. Br. Brisbane Mahogany, Brush Box. N.S.W., Queensland. 20, 24.  
*T. suaveolens* (Gaertn.) Sm. Swamp Mahogany. Swamp Box. W. Australia. 3, 20.  
*Eugenia angophoroides* F. v. M. Scrub Mahogany. N. Australia. 20.  
*Lysicarpus ternifolius* F. v. M. Tom Russell's Mahogany. Queensland. 20.

## XX. LECYTHIDACEAE

- Cariniana pyriformis* Miers. Columbian Mahogany. Colombia. 7, 13, 14.  
*C. estrellensis* (Raddi) O. Kze. Brazilian Mahogany. Brazil. (C. *excelsa* Casar). 7.  
*C. domestica* (Mart.) Miers. Brazilian Mahogany. Brazil. 7.  
*C. legalis* (Mart.) O. Kze. Brazilian Mahogany. Brazil. (C. *brasiliensis* Casar). 7.

## XXI. RUBIACEAE

- Adina Galpinii* Oliv. Mahogany, African Teak. Portuguese E. Africa. 19.  
*Sarcocephalus Diderrichii* De Wild. Gaboon Mahogany. Trop. Africa, Congo. 24.  
*S. Trillesii* Pierre. Bilinga Mahogany. Congo. 24.  
*Corynanthe pachyceras* K. Schum. Gummy Mahogany. Nigeria. 23. (C. *paniculata* Welw.)  
*\*Mitragyna stipulosa* O. Kuntze. W. African Mahogany. Nigeria. 6, 9. (M. *macrophylla* Hiern).

## XXII. SAPOTACEAE

- Manilkara multinervis* Dubard. Mahogany, Agonokwi. W. Africa. 6, 13, 24. (Mimusops *multinervis* Baker).  
*Manilkara lacera* Dubard. Mahogany. Nigeria. 23. (Mimusops *lacera* Baker).  
*\*Mimusops globosa* Gaertn. Mahogany, Balata, Bulletwood. C. America. 3, 13.  
*M. djave* Engl. Congo Mahogany, Cherry Mahogany. Congo. 6, 14, 23. (Baillonella *Djave* Pierre). 3.

\**M. Heckelii* Hutch. & Dalziel. Abeku Mahogany. Gold Coast, Nigeria. 6.

(*Dumoria Heckelii* A. Chev.).

*Mimusops* sp. Benin Mahogany. Liberia, Sierra Leone. 23.

\**Achras Sapota* L. Mahogany, Nispero. Mexico, C. America. 13.

#### XXIII. EBENACEAE

*Royena* sp. Mkuka Mahogany. Tanganyika. 21.

#### XXIV. STYRACEAE

*Liquidambar styraciflua* L. Mahogany, Red Gum. U.S.A. 13.

#### XXV. APOCYNACEAE

\**Alstonia scholaris* (L.) R. Br. Zitronen Mahagoni (Yellow Mahogany) E. Indies. 14.

#### XXVI. BORAGINACEAE

*Cordia Goeldiana* Huber. S. American Mahogany. Brazil. 7.

#### XXVII. BIGNONIACEAE

*Tabebuia Donnell-Smithii* Rose. White-, Prima Vera Mahogany. Mexico. 13, 15, 24.

#### XXVIII. MYRISTICACEAE

*Myristica* sp. Acajou Marron (Chestnut Mahogany). Trinidad. 14.

#### XXIX. LAURACEAE

\**Persea indica* Spreng. Madeira Mahogany, Vinacito. Canary Is. 13, 24.

"*Nectandra Wana*." Surinam Mahogany. W. Indies. 7.

\**N. Pisi* Miq. Surinam Mahogany. W. Indies. 7.

*Endiandra Palmerstonii* C. T. White. Black Mahogany. Queensland. 14.

#### XXX. EUPHORBIACEAE

\**Ricinodendron africanum* Muell.-Arg. African Mahogany. Trop. Africa. 13, 23, 24.

(*R. Heudelotii* Pierre). Mahogany, Kino, Okwen. Trop. Africa. 13, 23, 24.

\**R. Rautanenii* Schinz. Mahogany, Yoruba Coffin Wood. Nigeria. 23. (" *R. Rauwenii* ").

*Uapaca Heudelotii* Baill. Mahogany, Yeye. Nigeria. 23.

*U. guineensis* Muell.-Arg. False Mahogany. Nigeria. 23.

#### XXXI. ARTOCARPACEAE

\**Artocarpus integra* (Thunb.) Merr. Indian Mahogany, Jackwood. India. 13, 24.

#### XXXII. MORACEAE

\**Chlorophora excelsa* Benth. & Hook.f. Swamp Mahogany, Iroko. Trop. Africa. 3.

*Treculia africana* Decne. Acajou (Mahogany). Ivory Coast. 14.

#### XXXIII. JUGLANDACEAE

*Juglans regia* L. var.? Acajou d'Europe (European Mahogany). France. 14.

#### XXXIV. BETULACEAE

\**Betula lutea* Michx. Mountain Mahogany, Grey Birch. U.S.A. 13, 14, 17.

\**B. lenta* L. Mountain Mahogany, Black Birch. U.S.A. 7, 14, 17.

#### XXXV. SALICACEAE

*Populus monilifera* Ait. Indian Mahogany, Cottonwood. N. America, 25.

(*P. deltoides* Marsh) 19a.

#### Index of Common Names

Abeku Mahogany. \**Mimusops Heckelii* Hutch. & J. M. Dalz. Gold Coast, Nigeria. XXII.

Acajou (Mahogany). \**Anacardium occidentale* L. S. America. XV.

Acajou (Mahogany). \**Guarea glabra* Vahl. S. America. XIII.

Acajou (Mahogany). *Treculia africana* Decne. Ivory Coast. XXXII.

Acajou Aboudikro (Aboudikro Mahogany). *Entandrophragma tomentosum* A. Chev. Ivory Coast. XIII.

Acajou Bâtard (Bastard Mahogany). \**Curatella americana* L. French Guiana. I.

Acajou Blanc (White Mahogany). \**Khaya anthotheca* C.DC. (*K. agboensis* A. Chev. *K. euryphylla* Harms). Ivory Coast, Nigeria. XIII.

Acajou Blanc (White Mahogany). *Oncocarpus vitiensis* A. Gray (*Semecarpus atra* Vieill.). New Caledonia. XV.

Acajou Blanc (White Mahogany). \**Simaruba amara* Aubl. Guadeloupe. XI.

Acajou d'Afrique (African Mahogany). *Zizyphus vulgaris* Lamk. Tunis. XIV.

Acajou de Cayenne (Cayenne Mahogany). *Cedrela guianensis* A. Juss. French Guiana. XIII.

Acajou de Chine (Chinese Mahogany). \**Cedrela sinensis* A. Juss. (*Toona sinensis* Roem.). E. Asia. XIII.

Acajou d'Europe (European Mahogany). *Juglans regia* L. var.? France. XXXIII.

Acajou du Gamboge. *Tarrietia javanica* Blume (*T. cochinchinensis* Pierre). Cochin China. VIII.

Acajou Magona (Magona Mahogany). *Lannea Welwitschii* Engl. Cameroons. XV.

Acajou Marron (Chestnut Mahogany). *Myristica* sp. Trinidad. XXVIII.

Acajou résineux (Resinous Mahogany). *Tarrietia utilis* Sprague. Ivory Coast. VIII.

Acajou Rose de Tonkin (Tonkin Rose Mahogany). \**Melia Azedarach* L. Indo-China. XIII.

Acajou Wood (Mahogany Wood). \**Cedrela fissilis* Vell. Brazil. XIII. African Mahogany. \**Azzeria africana* Smith. Nigeria. XVI.

African Mahogany. *Carapa procera* DC. (*C. Gogo* A. Chev.), (*C. velutina* C.DC.), (*C. guyanensis* Oliv.), (*C. guineensis* G. Don). W. Africa. XIII.

African Mahogany. *Carapa* sp. (*Xylocarpus* sp.). E. Africa. XIII.

- African Mahogany. *Entandrophragma caudatum* Sprague (*Pseudocedrela caudata* Sprague). Trop. W. Africa. XIII.
- African Mahogany. *Entandrophragma macrophyllum* A. Chev. Trop. W. Africa. XIII.
- African Mahogany. \**Entandrophragma utile* Sprague (*Pseudocedrela utilis* Dawe & Sprague). Tropical W. Africa. XIII.
- African Mahogany. *Khaya caudata* Stapf. Gold Coast. XIII.
- African Mahogany. \**Khaya ivorensis* A. Chev. (*K. Klainei* Pierre). Ivory Coast to Gaboon. XIII.
- African Mahogany. \**Khaya senegalensis* A. Juss. (*K. Kerstingii* Engl.). Sudan, Uganda, Cameroons. XIII.
- African Mahogany. *Lonchocarpus laxiflorus* Guill. & Perr. Nigeria. XVI.
- African Mahogany. \**Ricinodendron africanum* Muell.-Arg. Trop. Africa. XXX.
- African Mahogany. \**Tarrietia utilis* Sprague. Gold Coast, Liberia. VIII.
- African Mahogany. \**Entandrophragma Candollei* Harms. (*E. ferrugineum* A. Chev.). Tropical W. Africa. XIII.
- Annam Mahogany. *Aglaia gigantea* Pellegr. Annam. XIII.
- Australian Mahogany. *Cedrela australis* F. v. M. (*Toona australis* (F. v. M.) Harms). Australia. XIII.
- Australian Mahogany. *Cedrela serrata* Royle (*Toona serrata* Roem.). India, Ceylon. XIII.
- Australian Mahogany. \**Cedrela Toona* Roxb. (*Toona ciliata* Roem.). India, Australia. XIII.
- Australian Mahogany. \**Dysoxylum Fraserianum* Benth. Australia. XIII.
- Australian Mahogany. \**Synoum glandulosum* A. Juss. Queensland, N.S.W. XIII.
- Bastard Mahogany. *Cabralea* sp. Brazil. XIII.
- Bastard Mahogany. \**Eucalyptus botryoides* Sm. Victoria, N.S.W. XIX.
- Bastard Mahogany. \**Eucalyptus marginata* Sm. W. Australia. XIX.
- Bastard Mahogany. *Ochrocarpus africanus* Oliv. Liberia. IV.
- Bataan Mahogany. *Shorea polysperma* (Blanco) Merr. Philippine Is. VI.
- Bay Mahogany. \**Cercocarpus ledifolius* Nutt. U.S.A. XVII.
- Benin Mahogany. *Khaya grandifoliola* C.DC. (*K. grandifolia* Stapf). French Guinea to E. Sudan. XIII.
- Benin Mahogany. \**Khaya senegalensis* A. Juss. Sudan, Uganda. XIII.
- Benin Mahogany. *Mimusops* sp. Liberia, Sierra Leone. XXII.
- Benin Mahogany. \**Parinari robusta* Oliv. Nigeria. XVII.
- Benin Mahogany. *Trichilia Prieuriana* A.Juss. Cape Verde to Congo. XIII.
- Big Leaf Mahogany. *Khaya grandifoliola* C.DC. (*K. grandifolia* Stapf). French Guinea to E. Sudan. XIII.
- Bilinga Mahogany. *Sarcocephalus Trillesii* Pierre. Congo. XXI.



- Black Mahogany. *Endiandra Palmerstonii* C. T. White. Queensland. XXIX.
- Blue Mahogany. \**Hibiscus elatus* Sw. W. Indies. VII.
- Borneo Mahogany. \**Calophyllum inophyllum* L. India, Burma. IV.
- Bossé Mahogany. *Guarea cedrata* Pellegr. Ivory Coast. XIII.
- Bossé Mahogany. *Guarea Thompsonii* Sprague & Hutch. S. Nigeria, Gold Coast. XIII.
- Brass Mahogany Bark Tree. \**Saccoglottis gabonensis* Urban. (*Aubrya gabonensis* Baill.). Nigeria. X.
- Brazilian Mahogany. \**Carapa guianensis* Aubl. British Guiana. XIII.
- Brazilian Mahogany. \**Carapa procera* DC. W. Africa, W. Indies, Guiana. XIII.
- Brazilian Mahogany. *Cariniana domestica* (Mart.) Miers. Brazil. XX.
- Brazilian Mahogany. *Cariniana estrellensis* (Raddi) O. Kze. (*C. excelsa* Casar). XX.
- Brazilian Mahogany. *Cariniana legalis* (Mart.) O. Kze. (*C. brasiliensis* Casar). Brazil. XX.
- Brazilian Mahogany. *Plathymenia foliolosa* Benth. (*P. foliosa* Benth.) Brazil. XVI.
- Brazilian Mahogany. *Plathymenia reticulata* Benth. Brazil. XVI.
- Brisbane Mahogany. \**Tristania conferta* R. Br. N.S.W., Queensland. XIX.
- British Guiana Mahogany. *Carapa surinamensis* Miq. Surinam. XIII.
- Brown Mahogany. \**Entandrophragma septentrionale* A. Chev. Gold Coast. XIII.
- Brown Mahogany. \**Lovoa Klaineana* Pierre. Gold Coast, Nigeria. XIII.
- Brown Mahogany. \**Lovoa Swynnertonii* E. G. Baker. C. Africa. XIII.
- Burma Mahogany. \**Pentace burmanica* Kurz. Burma. IX.
- Burma Mahogany. *Pentace Griffithii* King. Burma. IX.
- Cameroon Mahogany. *Entandrophragma Rederi* Harms. Cameroons. XIII.
- Caoba Falsa (False Mahogany). *Bauhinia candicans* Benth. Argentine XVI.
- Cape Mahogany. \**Ptaeroxylon obliquum* (Thunb.) Radlk. S. Africa. XIII.
- Cape Mahogany. \**Trichilia emetica* Vahl. Uganda, Rhodesia. XIII.
- Cedar Mahogany. \**Entandrophragma cylindricum* Sprague (*E. rufum* Chev.), (*Pseudocedrela cylindrica* Sprague). Tropical W. Africa. XIII.
- Cedar Mahogany. \**Entandrophragma utile* Sprague (*Pseudocedrela utilis* Dawe & Sprague). Tropical W. Africa. XIII.
- Cedar Mahogany. *Guarea Thompsonii* Sprague & Hutch. S. Nigeria, Gold Coast. XIII.
- Ceylon Mahogany. *Melia dubia* Cav. Ceylon. XIII.
- Cherry Mahogany. *Mimusops djave* Engl. (*Baillonella Djave* Pierre). Congo. XXII.

Chijole Mahogany. \**Calophyllum antillanum* Britton (C. Calaba Jacq.)  
 Tropical America. IV.  
 Coffee Tree Mahogany. \**Gymnocladus dioica* Koch. N. America. XVI.  
 Cola Mahogany. *Cola cauliflora* Mast. Nigeria. VIII.  
 Columbian Mahogany. *Cariniana pyriformis* Miers. Columbia.  
 Congo Mahogany. *Mimusops djave* Engl. (*Baillonella Djave* Pierre).  
 Congo. XXII.  
 Cuba Mahogany. \**Lysiloma Sabicu* Benth. W. Indies. XVI.  
 Cuba Mahogany. *Pithecellobium arboreum* (L.) Urb. W. Indies. XVI.  
 Demerara Mahogany. \**Carapa guianensis* Aubl. British Guiana.  
 XIII.  
 Derham Mahogany. *Wallaceodendron celebicum* Koord. Philippine Is.  
 XVI.  
 Detarr Mahogany. \**Detarium senegalense* Gmelin. Tropical W.  
 W. Africa. XVI.  
 Duika Mahogany (possibly). \**Irvingia gabonensis* Baill. (*I. Barteri*  
 Hook.f.). Cameroons. XI.  
 Edjun Mahogany. *Canarium Mansfeldianum* Engl. Nigeria. XII.  
 E. Indian Mahogany. \**Chukrasia tabularis* A. Juss. India, Burma.  
 XIII.  
 E. Indian Mahogany. \**Pterocarpus dalbergioides* Roxb. E. Indies.  
 XVI.  
 E. Indian Mahogany. *Shorea Curtisii* Dyer. Malay, Borneo. VI.  
 E. Indian Mahogany. \**Shorea robusta* Gaertn.f. India. VI.  
 E. Indian Mahogany. \**Soymida febrifuga* A. Juss. Ceylon. XIII.  
 False Mahogany. *Uapaca guineensis* Muell. Nigeria. XXX.  
 False Hill Mahogany. *Cistanthera papaverifera* A. Chev. Nigeria. IX.  
 Fiji Mahogany. \**Calophyllum Calaba* L. (C. *Burmanni* Wight). Fiji,  
 Ceylon. IV.  
 Fiji Mahogany. \**Calophyllum spectabile* Willd. Fiji, Burma. IV.  
 Forest Mahogany. \**Eucalyptus resinifera* Sm. (*E. hemilampra* F.v.M.).  
 N.S.W., Queensland. XIX.  
 Gaboon Mahogany. \**Aucoumea Klaineana* Pierre. Gaboon. XII.  
 Gaboon Mahogany. *Canarium Schweinfurthii* Engl. Nigeria, C.  
 Africa. XII.  
 Gaboon Mahogany. *Entandrophragma Pierrei* A. Chev. Gaboon.  
 XIII.  
 Gaboon Mahogany. \**Khaya anthotheca* C.DC. (*K. agboensis* A. Chev.),  
 (*K. euryphylla* Harms). Nigeria, Ivory Coast. XIII.  
 Gaboon Mahogany. *Sarcocephalus Diderrichii* De Wild. Tropical  
 Africa. XXI.  
 Gogo Mahogany. *Carapa procera* DC. (C. Gogo A. Chev.), (*C. velutina*  
 C.DC.). W. Africa. XIII.  
 Grand Bassam Mahogany. \**Khaya ivorensis* A. Chev. Ivory Coast  
 to Gaboon. XIII.  
 Gummy Mahogany. *Corynanthe pachyceras* K. Schum. Nigeria. XXI.  
 Hard Cedar Mahogany. *Pseudocedrela Kotschyi* Harms. French  
 Sudan, Nigeria. XIII.  
 Hard Mahogany. " *Detarium guineense*." Cameroons. XVI.

- Honduras Mahogany. \**Swietenia macrophylla* King. C. America. XIII.
- Horseflesh Mahogany. *Caesalpinia* sp. W. Indies. XVI.
- Horseflesh Mahogany. *Peltophorum adnatum* Griseb. W. Indies. XVI.
- Horseflesh Mahogany. \**Swartzia tomentosa* DC. S. America. XVI.
- Indian Mahogany. \**Artocarpus integra* (Thunb.) Merr. (*A. integrifolia* L.). India. XXXI.
- Indian Mahogany. \**Cedrela odorata* L. Cuba. XIII.
- Indian Mahogany. *Melia composita* Willd. India. XIII.
- Indian Mahogany. \**Pterocarpus indicus* Willd. India, Malay. XVI.
- Indian Mahogany. *Populus monilifera* Ait. N. America XXXV.
- Indian White Mahogany. *Canarium euphyllum* Kurz. Andaman Is. XII.
- Iron Mahogany. *Erythrophleum* sp. Australia. XVI.
- Juana Costa Mahogany. *Enterolobium cyclocarpum* Griseb. Tropical America. XVI.
- Konta Mahogany. *Azelia bracteata* T. Vogel. Liberia. XVI.
- Lagos Mahogany. *Khaya ivorensis* A. Chev. W. Africa. XIII.
- Lagos Mahogany. *Trichilia Prieuriana* A. Juss. Cape Verde to Congo. XIII.
- Libreville Mahogany. \**Aucoumea Klaineana* Pierre (*Boswellia Klaineana*). Gaboon. XII.
- Madagascar Mahogany. *Khaya madagascariensis* Jum. & Perrier. Madagascar. XIII.
- Madeira Mahogany. \**Persea indica* Spreng. Canary Is. XXIX.
- Madeira Mahogany. \**Tamarindus indica* L. W. Indies, Florida. XVI.
- Mahogany. *Acacia Koa* A. Gray. Philippine Is. XVI.
- Mahogany. \**Achras Sapota* L. Mexico, C. America. XXII.
- Mahogany. *Adina Galpinii* Oliv. Portuguese E. Africa. XXI.
- Mahogany. *Brachystegia eurycoma* Harms. Nigeria. XVI.
- Mahogany. \**Calophyllum brasiliense* Camb. Brazil. IV.
- Mahogany. *Caraipa grandiflora* Mart. Brazil. V.
- Mahogany. *Daniellia caudata* Craib. Nigeria. XVI.
- Mahogany. *Dialium Staudtii* Harms. Nigeria. XVI.
- Mahogany. *Didelotia africana* Baill. S. Nigeria. XVI.
- Mahogany. *Eucalyptus diversicolor* F. v. M. W. Australia. XIX.
- Mahogany. *Eucalyptus longifolia* Link and Otto. Victoria, N.S.W. XIX.
- Mahogany. *Eucalyptus pellita* F.v.M. Queensland, N.S.W. XIX.
- Mahogany. *Garcinia* sp. Liberia. IV.
- Mahogany. \**Gymnocladus dioica* Koch. N. America. XVI.
- Mahogany. \**Hymenaea Courbaril* L. S. America. XVI.
- Mahogany. *Liquidambar styraciflua* L. U.S.A. XXIV.
- Mahogany. *Manilkara lacera* Dubard. (*Mimusops lacera* Baker). Nigeria. XXII.
- Mahogany. *Manilkara multinervis* Dubard. (*Mimusops multinervis* Baker). W. Africa. XXII.
- Mahogany. *Melanorrhoea laccifera* Pierre. Indo-China. XV.
- Mahogany. *Mimusops globosa* Gaertn. C. America. XXII.

Mahogany. *Poeppigia excelsa* A. Rich. San Domingo. XVI.  
 Mahogany. \**Protium altissimum* March. Guiana. XII.  
 Mahogany. *Rhus integrifolia* (Nutt.) Benth. & Hook. f. California. XV.  
 Mahogany. *Ricinodendron Africanum* Muell.-Arg. Trop. Africa. XXX.  
 Mahogany. \**Ricinodendron Rautanenii* Schinz. ("R. Rautenii").  
 Nigeria. XXX.  
 Mahogany. \**Saccoglottis gabonensis* Urban. (*Aubrya gabonensis* Baill.)  
 Liberia, Nigeria. X.  
 Mahogany. *Uapaca Heudelotii* Baill. Nigeria. XXX.  
 Mahogany Nut. \**Parinari gabunensis* Engl. Nigeria. XVII.  
 Mahogany Nut. \**Parinari robusta* Oliv. Nigeria. XVII.  
 Mbolo Mahogany. *Entandrophragma Bussei* Harms. W. Africa. XIII.  
 Mexican Mahogany. \**Swietenia humilis* Zucc. Mexico. XIII.  
 Miva Mahogany. *Dysoxylum cerebriforme* F. M. Bailey. Queensland.  
 XIII.  
 Miva Mahogany. \**Dysoxylum Muelleri* Benth. Queensland. XIII.  
 Mkuka Mahogany. *Royena* sp. Tanganyika. XXIII.  
 Mountain Mahogany. *Betula lenta* L. U.S.A. XXXIV.  
 Mountain Mahogany. \**Betula lutea* Michx. U.S.A. XXXIV.  
 Mountain Mahogany. \**Cercocarpus ledifolius* Nutt. U.S.A. XVII.  
 Mountain Mahogany. \**Cercocarpus parvifolius* Nutt. U.S.A. XVII.  
 Mountain Mahogany. *Lonchocarpus* sp. (probably *Peltophorum* sp.).  
 Sierra Leone. XVI.  
 Natal Mahogany. \**Kiggelaria africana* L. (*K. Dregeana* Turcz.).  
 Natal. II.  
 Natal Mahogany. \**Trichilia emetica* Vahl. Uganda, Rhodesia. XIII.  
 New Zealand Mahogany. *Dysoxylum spectabile* Hook.f. New Zealand.  
 XIII.  
 Panama Mahogany. *Anacardium Rhinocarpus* DC. C. and S. America.  
 XV.  
 Philippine Mahogany. *Dipterocarpus* sp. Philippine Is., Malay. VI.  
 Philippine Mahogany. \**Pterocarpus indicus* Willd. India, Malay.  
 XVI.  
 Philippine Mahogany. *Shorea negrosensis* Foxw. Philippine Is. VI.  
 Philippine Mahogany. *Tarrietia javanica* Blume. Philippine Is. VIII.  
 Philippine Mahogany. *Tarrietia sylvatica* (Vid.) Merr. Philippine Is.  
 Cochin China. VIII.  
 Pink Mahogany. *Gossweilerodendron balsamiferum* Harms. Nigeria,  
 Congo. XVI.  
 Pink Mahogany. *Guarea cedrata* Pellegr. Ivory Coast. XIII.  
 Prima Vera Mahogany. *Tabebuia Donnell-Smithii* Rose. Mexico.  
 XXVII.  
 Quibaba da Queta Mahogany. *Entandrophragma angolense* (Welw.)  
 C.DC. (*Swietenia angolense* Welw.). Angola. XIII.  
 Red Mahogany. *Eucalyptus gomphocephala* DC. N.S.W. XIX.  
 Red Mahogany. *Eucalyptus Kirtoniana* F.v.M. (*E. parentinervis*  
 R. T. Baker). N.S.W., Queensland. XIX.  
 Red Mahogany: \**Eucalyptus microcorys* F.v.M. N.S.W., Queensland.  
 XIX.

- Red Mahogany. *Eucalyptus polyanthemos* Schauer. N.S.W. XIX.
- Red Mahogany. \**Eucalyptus resinifera* Sm. (*E. hemilampra* F.v.M.). N.S.W., Queensland. XIX.
- Red Mahogany. \**Khaya ivorensis* A. Chev. Ivory Coast to Gaboon. XIII.
- Red Mahogany. *Parinari* sp. Nigeria. XVII.
- Rhodesian Mahogany. \**Azelia quanzensis* Welw. Rhodesia. XVI.
- Rhodesian Mahogany. \**Copaifera coleosperma* Benth. S. Rhodesia. XVI.
- Rhodesian Mahogany. \**Khaya nyasica* Stapf. Rhodesia, C. Africa. XIII.
- Rose Mahogany. \**Dysoxylum Fraserianum* Benth. (*D. Lessertianum* Benth.). Australia. XIII.
- Rose Mahogany. *Dysoxylum Pettigrewianum* F. M. Bailey. Queensland. XIII.
- Santa Maria Mahogany. *Calophyllum antillanum* Britton (\**C. Calaba* Jacq.). Trop. America. IV.
- Sapeli Mahogany. *Entandrophragma utile* Sprague. W. Africa. XIII.
- Satin Mahogany. \**Calophyllum australianum* F.v.M. Queensland. IV.
- Satin Mahogany. *Calophyllum costatum*. F. M. Bailey. Queensland.
- Satin Mahogany. \**Calophyllum tomentosum* Wight. India, Ceylon. IV.
- Satin Mahogany. *Calophyllum Touriga* C. T. White & Francis. Queensland. IV.
- Satin Mahogany. *Guarea africana* Welw. Liberia. XIII.
- Scented Mahogany. *Guarea glomerulata* Harms. Cameroons, Nigeria. XIII.
- Scented Mahogany. *Guarea Thompsonii* Sprague & Hutch. S. Nigeria, Gold Coast. XIII.
- Scented Mahogany. *Entandrophragma Candollei* Harms. W. Africa. XIII.
- Scrub Mahogany. *Eugenia angophoroides* F. v. M. N. Australia. XIX.
- Scrub Mahogany. \**Synoum glandulosum* A. Juss. Queensland, N.S.W. XIII.
- S. American Mahogany. *Cordia Goeldiana* Huber. Brazil. XXVI.
- Spanish Mahogany. \**Swietenia Mahagoni* Jacq. W. Indies. XIII.
- Spur Mahogany. *Dysoxylum Pettigrewianum* F. M. Bailey. Queensland. XIII.
- Straits Mahogany. *Melanorrhoea Maingayi* Hook.f. Malaya, Sunda. XV.
- Surinam Mahogany. *Nectandra Pisi* Miq. W. Indies. XXIX.
- Surinam Mahogany. "*Nectandra Wana*". W. Indies. XXIX.
- Swamp Mahogany. \**Chlorophora excelsa* Benth. & Hook.f. Trop. Africa. XXXII.
- Swamp Mahogany. \**Eucalyptus botryoides* Sm. Victoria, N.S.W. XIX.
- Swamp Mahogany. \**Eucalyptus robusta* Sm. N.S.W., Queensland. XIX.
- Swamp Mahogany. \**Tristania laurina* R. Br. Victoria, Queensland. XIX.

- Swamp Mahogany. *Tristania suaveolens* (Gaertn.) Sm. W. Australia. XIX.
- Tenasserim Mahogany. *\*Pterocarpus dalbergioides* Roxb. E. Indies. XVI.
- Tenasserim Mahogany. *\*Pterocarpus macrocarpus* Kurz. Burma. XVI.
- Togo Mahogany. *\*Khaya senegalensis* A.Juss. Trop. Africa. XIII.
- Tom Russell's Mahogany. *Lysicarpus ternifolius* F. v. M. Queensland. XIX.
- Valley Mahogany. *\*Cercocarpus parvifolius* Nutt. U.S.A. XVII.
- Venezuelan Mahogany. *Swietenia Candollei* Pittier. Venezuela. XIII.
- W. African Mahogany. *Entandrophragma excelsum* Sprague (*Pseudocedrela excelsa* Dawe & Sprague). Tropical W. Africa. XIII.
- W. African Mahogany. *\*Mitragyna stipulosa* O. Kze. (*M. macrophylla* Hiern). Nigeria. XXI.
- White Mahogany. *Antrocaryon Klaineum* Pierre. Cameroons. XV.
- White Mahogany. *Entandrophragma macrophyllum* A. Chev. Tropical W. Africa. XIII.
- White Mahogany. *\*Eucalyptus acmenioides* Schauer. N.S.W., Queensland. XIX.
- White Mahogany. *Eucalyptus Consideniana* Maiden. N.S.W. XIX.
- White Mahogany. *\*Eucalyptus obliqua* L'Hérit. N.S.W. XIX.
- White Mahogany. *\*Eucalyptus pilularis* Smith var. *Muelleriana* (Hewitt) Maiden. N.S.W. XIX.
- White Mahogany. *Eucalyptus robusta* Sm. N.S.W., Queensland. XIX.
- White Mahogany. *Eucalyptus umbra* R. T. Baker. N.S.W. XIX.
- White Mahogany. *Khaya anthotheca* C.DC. Nigeria. XIII.
- White Mahogany. *\*Piptadenia africana* Hook. f. Tropical W. Africa. XVI.
- White Mahogany. *Santiriopsis Klaineana* Pierre. Nigeria. XII.
- White Mahogany. *Tabebuia Donnell-Smithii* Rose. Mexico. XXVII.
- White Mahogany. *Vochysia hondurensis* Sprague. British Honduras. III.
- Wild Mahogany. *Mosquitoxylum jamaicense* Krug. & Urb. British Honduras. XV.
- Yellow Mahogany. *Plathymenia foliolosa* Benth. (*P. foliosa* Benth.). Brazil. XVI.
- Yellow Mahogany. *Plathymenia reticulata* Benth. Brazil. XVI.
- Yellow Mahogany. *Terminalia superba* Engl. & Diels. W. Africa. XVIII.
- Zitronen Mahagoni (Yellow Mahogany). *\*Alstonia scholaris* (L.) R. Br. E. Indies. XXV.

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## XXI—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXVI.\* N. Y. SANDWITH.

### THE GENUS TOVOMITA IN BRITISH GUIANA.

The Tovomitae of British Guiana are noteworthy for their habit and their common occurrence in the coastal rain-forests; no species has yet been discovered which is confined to the sandstone districts or mountains of the interior. They are small laticiferous trees with stilt roots of varying height, and are found in several kinds of habitat and forest-type; thus they are seen about equally on clay or on sand, in swampy gullies, on slopes or on hill-tops, from mora forest up to wallaba (see Davis and Richards, *Journal of Eco-*

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\*Continued from K.B. 1936, 16.

logy, 22, 129). The Arawaks know them by the name *Awasakuli*, and distinguish only "small-leaved" and "large-leaved" (or broad-leaved) kinds. The existing herbarium material, however, has yielded evidence for the occurrence in the Colony of at least nine, and possibly of ten, species. This may be compared with the known representation of the genus in Surinam (6 species) and in Trinidad (a single species), but not with its high development in Amazonian Brazil, Peru and Venezuela. In the present account, three new species are proposed, two of them based on material of single collections; two, *T. macrophylla* Walp. and *T. Choisyana* Pl. et Tr., are recorded for the first time from British Guiana, but further material of both is needed for confirmation of the identification; while two are reduced, *T. Jenmani* Engl. to *T. brevistaminea* Engl., and *T. nigrescens* Pl. et Tr. to *T. umbellata* Benth. which, it is shown, may or may not be a native of the Colony.

The key, which is based on existing herbarium specimens, must be regarded as purely temporary owing to the difficulty in assembling complete material of species of this genus. This is due to the common dioecism, which is responsible for a widely different appearance in the male and female inflorescence of a given species and, in some at least, for a larger flower with longer (and sometimes thinner) filaments in the female. It is unfortunate that only the male inflorescence, and no fruit, is present in the material of three species (*obscura*, *umbellata*, *calodictyos*), that it is absent in another (*Choisyana*) which is provisionally recorded, and that the record of one (*macrophylla*) is based on the evidence of branchlets, leaves and fruit.

It might be suggested that the keys for distinguishing species of tropical forest trees should consist entirely of characters taken from the branchlets and leaves. This might indeed be possible for many genera, after an extremely intimate study of venation, but such keys would almost always require elaborate illustration, and anatomical characters are useless for field and herbarium work. A student of the leaves of *Tovomita* might well shrink from attempting such a task. The extraordinary variation in the dimensions and shape of the leaves of each species becomes a minor matter when one is further confronted with variability in the prominence and direction of the principal nerves. The venation would not, perhaps, have been such a source of difficulty if this very prominence and direction had not been employed by Vesque for the division of the genus into his two sections, *Clusiaefoliae* and *Chrysochlamydifoliae*. The extremes of these supposed sections look, indeed, very widely different; of the species dealt with below, *obscura*, *cephalostigma* and *umbellata* (at any rate, by the upper surface) fall happily and unmistakably into the first, while *calodictyos*, *macrophylla*, *Choisyana* and *obovata* can safely be assigned to the second. But what shall we say of the other three, *grata*, *brevistaminea* (*Clusiaefoliae*) and *Schomburgkii* (*Chrysochlamydifoliae*), the first two of which are not convincing members of either section, while in the two latter a



straight and a strongly arcuate principal lateral nerve may often be seen adjacent on the same leaf? The fact is that the venation cannot be used as a sectional character owing to its intermediate nature in certain species. The arching or straightness of the principal laterals is often far too much a matter of degree, varying on the same leaf or from leaf to leaf; the distinction by their greater prominence of these nerves from the intermediate laterals or "lesser primaries" also varies from leaf to leaf, or from surface to surface, in several species; while the behaviour of these intermediate laterals themselves is most perplexing, since they may either simulate the length and direction of the principal nerves (character of *Clusiaefoliae*) or may run obliquely, often for only a short distance, or curve round quickly almost at a right angle (characters found in *Chrysochlamydisfoliae*). In the key given below the outstanding prominence of the main lateral nerves is adopted as a primary division, since it is an obvious and helpful character, but direction and arching are hardly ever employed, and the distance of nerves from each other is only used when it is made quite clear which ranks are involved; in this way a kind of compromise has been reached between the two supposed sections, but only by placing *T. grata* and *T. brevistaminea* in both halves of the key.

#### KEY TO THE BRITISH GUIANA SPECIES OF TOVOMITA.

Main primary lateral nerves of the leaves not distinctly stronger than the others, the leaf surface therefore occupied by numerous close parallel lateral nerves less than 5 mm. apart:

Filaments of ♂ flowers (also of ♀ where known) more than 50, the outermost not very conspicuously shorter than the others, all thin and linear:

Leaves small, normally less than 10 cm. long, shortly obtusely acuminate or cuspidate; petiole usually less than 1.5 cm. long; perianth segments commonly 9, petals not decussate with sepals .....4. *grata*

Leaves of medium size, normally more than 10 cm. long, acutely long-acuminate; petiole usually more than 1.5 cm. long; perianth segments 6, petals decussate with sepals .....1. *obscura*

Filaments of ♂ flowers (also of ♀ where known) less than 50, either the outermost extremely short, or all of them short, fat and clubshaped:

Filaments fat, flattish, clubshaped, only up to 3 mm. long in ♂ flowers; ♂ inflorescences about 3 cm. long: .....5. *brevistaminea*

Filaments thin, linear:

Leaves elliptic, not at all or very shortly cuspidate-acuminate; ♂ inflorescences short, condensed, 3.5 cm. long or less.....2. *umbellata*

Leaves usually distinctly broader above the middle and more or less obovate or obovate-elliptic, conspicuously

- cuspidate-acuminate ; ♂ inflorescences large, lax, with long widely-spreading branches far exceeding 3 cm. in length .....3. *cephalostigma*
- Main primary lateral nerves distinctly stronger than the others, more (often much more) than 5 mm. apart :
- Leaves copiously and regularly dotted beneath, coriaceous ; main lateral nerves numerous, normally more than 10, curving up to the margin ; expanded flowers 2 cm. or more in diam. ....7. *macrophylla*
- Leaves not copiously dotted beneath :
- Leaves papery or thinly coriaceous ; flowers rather small, 1.5 cm. or less in diam. ; petals decussate with sepals ; filaments 5 mm. long or shorter ; no remains of flower at base of ripe fruit (fruit unknown in *calodictyos*) :
- Main lateral nerves 16 or more, conspicuously anastomosing at some distance from the margin ; inflorescence much branched, up to 12.5 cm. long.....8. *calodictyos*
- Main lateral nerves about 10 or fewer, nearly straight or conspicuously curving up to the margin ; inflorescence short, little branched, up to about 3 cm. long :
- Leaves drying reddish-brown beneath ; filaments fat and club-shaped, less than 25, very short in the ♂ flower (about 2-3 mm. long) .....5. *brevistaminea*
- Leaves drying green beneath ; filaments slender and linear, more than 25, not conspicuously short in the ♂ flower  
6. *Schomburgkii*
- Leaves stiffly papery to thickly coriaceous ; flowers large for the genus, 1.5-3 cm. diam. ; petals not decussate with sepals ; filaments numerous, the longest exceeding 5 mm. ; remains of flower persistent at base of ripe fruit :
- Leaves small, up to 12 cm. long, main lateral nerves normally less than 1 cm. apart, often scarcely distinguishable from intermediate laterals ; flowers not very large, petals not exceeding 10 mm., and longest filaments not exceeding 8 mm. in length.....4. *grata*
- Leaves larger, normally more than 12 cm. long, main lateral nerves normally much more than 1 cm. apart, sharply distinguished ; flowers large, petals usually exceeding 10 mm., and longest filaments usually exceeding 8 mm. in length :
- Leaves stiffly papery to coriaceous, lanceolate, oblong or elliptic, attenuate to an acute, obtuse or slightly acuminate apex .....9. *Choisyana*
- Leaves thickly coriaceous, the minor venation often completely impressed, obovate or obovate-oblong, rounded or emarginate at apex, rarely very shortly acutely cuspidate .....10. *obovata*

## ENUMERATION OF SPECIES

1. *Tovomita* (§ "*Clusiifoliae*") *obscura* *Sandwith* sp. nov.; *T. cephalostigmati* Vesque atque *T. umbellatae* Bth. affinis, ab ambabus staminibus floris masculi multo numerosioribus haud valde conspicue inaequalibus, praeterea ab illa inflorescentia mascula brevi multo minus evoluta, ab hac foliis longe acutissime acuminatis, alabastris florum masculorum majoribus differt.

*Arbor* parva, ramulis summis teretibus satis gracilibus. *Folia* elliptica vel obovato-elliptica, apice conspicue longe (nonnunquam ad 2 cm.) acutissime acuminata, rarius cuspidata, basi acute cuneata et in petiolum attenuata, 10–21.5 cm. longa, 3.7–8.3 cm. lata, firme chartacea, siccitate utrinque brunnescentia, costa supra paullum elevata vel subplana subtus prominente, nervis primariis lateralibus numerosis late adscendentibus subrectis secus marginem ipsum in nervum marginalem mergentibus utrinque prominulis, praeterea aliis e costa exorientibus interjectis, reticulatione utrinque saepius obvia, pagina inferiore exacte ut in *T. cephalostigmati* minute crebre rugulosa; petiolus 1.8–3 cm. longus. *Inflorescentia mascula* tantum visa, apice ramulorum terminalis, brevis, ad 3 cm. tantum longa, e basi quaternatim usque senatim ramosa; bractee inferiores triangulares acutae, superiores lanceolatae; pedicelli 3.5–5 mm. longi, sed floris terminalis usque 9 mm. longi. *Alabastra* matura ovoidea, plus minusve apiculata, 6–8 mm. longa, 4.5–6 mm. diametro. *Sepala* 2, alabastrum involventia, coriacea, 7.5–8 mm. longa. *Petala* 4, sepalis decussata, 2 exteriora (vel sepala interiora!) late ovato-oblonga, 7 mm. longa, 5 mm. lata, 2 interiora anguste oblonga, 7 mm. longa, 2.75 mm. lata. *Stamina* circiter 70, filamentis aliquantum inaequalibus, exterioribus 3 mm. longis, ceteris ad 5.5 mm. longis, omnibus linearibus gracilibus; antherae brevissimae, 0.3 mm. longae, filamentis haud latiores. *Fructus* ignotus.

BRITISH GUIANA. Bartica-Potaro Road, 88 miles from Bartica, c. 400 ft., June 27th, 1933, *Tutin* 300 (Brit. Mus.; Kew): tree 40 ft. high, 6 in. diam., in morabukea bush on red clayey soil; bark grey; flowers yellow-green.

Although only the male inflorescence is present, this combines with the long petioles and the characters of the leaf-blade to present a very distinct entity which cannot be referred to any known species.

2. *T. umbellata* *Benth.* in Hook. Lond. Journ. Bot. 2, 367 (1843); Walp. Rep. 2, 810 (1843); Planchon et Triana in Ann. Sci. Nat. sér. 4, 14, 280 (1860); Engler in Mart. Fl. Bras., 12, pars 1, 448 (1888), et in Pflanzenfam., 2 Aufl., 21, 207 (1925); Vesque, Ephar-mosis, 3, tt. 93, 94 (1892) et in DC. Mon. Phan., Guttiferae, 204 (1893).—*T. nigrescens* Pl. et Tr., l.c., 276; Engl., l.c., 450 et 207; Vesque, l.c., 208.

Without locality, 1838–1839, *Robert Schomburgk* 991 (type in Herb. Benth., Kew! Herb. Hook., Kew! Brit. Mus.! Herb. Boissier, Geneva, copied in error as 901, type of *T. nigrescens*!)

*Robert Schomburgk's* manuscript field-notes, preserved at

Kew, are as follows: "991. A tree 40 feet high, brown bark, spreading branches. Leaves lucid dark green, below lighter. Calix pea-green. Petals and fructification greenish-yellow, highly odoriferous." This information has been used in Bentham's description, but he has added "British Guiana" as the locality. For this there was no warrant. A study of Robert Schomburgk's letters to Bentham, read in conjunction with his published "Travels" and his manuscript field-notes, shows that no. 991 of Bentham's (the top) set was packed for despatch to England in the last consignment of this set (apparently of two boxes, one of them marked "G.B. 13") which contained material of all the specimens gathered by him between his departure from Fort Sao Joaquin, on the Rio Branco, on September 20th, 1838, and his final arrival in Georgetown on June 20th, 1839. No evidence has been discovered to show that Robert Schomburgk gave numbers to his gatherings in the sequence in which they were collected; the evidence of the manuscript notes and letters points rather to the probability of his having numbered them up at convenient stages of the journey when he had time to rest and prepare the despatch of his boxes of specimens. When no definite locality is given, it is quite likely that it had been forgotten. All we can reasonably say of any given number, therefore, when no locality is specified, is that it was collected between certain dates and between certain definite points of the itinerary. In the present instance, no. 991 may have been collected in British Guiana, in Venezuela, or in Brazil, since in the period mentioned above Schomburgk undertook his extremely hazardous journey *viâ* Pirara and Roraima (British Guiana) along the Parima and Padamo Rivers to Esmeralda and the Orinoco (Venezuela), then down the Cassiquiare to the Brazilian Rio Negro, where he collected many specimens which have been wrongly cited from British Guiana, and so back by the Rio Branco to the Rupununi District and Georgetown. Unfortunately, no other collections have yet been seen which can be referred with confidence to *T. umbellata*, so that the species must at present be included with some doubt in the flora of the Colony.

We now come to the question of the identity of *T. nigrescens* Pl. & Tr., which has hitherto been regarded as an independent species and which appeared to be unrepresented by authentic material at Kew. This seemed remarkable since the species was based by its authors on the specimen in the Boissier Herbarium at Geneva of no. 901 of Robert Schomburgk's same collection, of which the first and most complete set is at Kew. Not only did the description read sufficiently like that of *T. umbellata*, but no. 901 of the manuscript field-notes was described by Schomburgk as a herb with a cream-coloured catkin. Moreover, it was a significant and curious fact that none of the monographers who have dealt with these two species had examined the type material of both. Thus Planchon and Triana had not seen that of *T. umbellata*, Engler that of *T. nigrescens*, and Vesque that of *T. umbellata*; Vesque's

descriptions and figures of the latter (see Epharmosis, 3, tt. 93, 94) are taken from specimens collected by Mélinon in French Guiana. Even more recently, Dr. Eyma, in his critical notes on Surinam Tovomitae, mentions *T. nigrescens* alone, and cites specimens of this from Paris and the British Museum, but a search in the latter herbarium has revealed only the type collection of *T. umbellata*. The solution of all this seemed to lie in a copyist's error in writing the figures of the collector's number for certain sets, e.g. those now at Geneva and Paris, and this has now been proved by the comparison of the type of *T. umbellata* with that of *T. nigrescens* which has been kindly lent by the authorities of the Herbarium Boissier. The material of the two agrees perfectly and is quite obviously from the same gathering, which is proved by the field-notes to be no. 991. After this it is amusing to look back on the desperate efforts of Engler and Vesque to key off the two species by such unworkable characters as the texture of the leaves and the relation in breadth of the anther to the filament, though in fairness to Vesque it must be admitted that he was relying mainly on Mélinon's material for his conception of *T. umbellata*. Again, the interpretation of *T. nigrescens* had been made unnecessarily difficult for later workers by the authors of that species, who laid misleading stress on the colour of the buds which they described as "pube tenuissima adpressissima sericea aureocuprea subnitentia vel glabrata." This colour, which is to be seen also on the pedicels, does not in fact appear to be due to any pubescence, however minute, the presence of which would be most unexpected in any species of this genus.

3. *T. cephalostigma* Vesque, l.c. t. 96, et l.c. 207; Engl., l.c. 207; Sandwith in Kew Bull. 1931, 176; Eyma, Polygonaceae, Guttiferae and Lecythidaceae of Surinam, 44 (1932) et in Fl. Surinam, 3, 104 (1934).—*T. guianensis* Engl., l.c. 446, partim, non Aubl.

For localities and notes, see Kew Bull. 1931, 176. Probably frequent on sandy soils and in wallaba forest. Usually a small tree. The leaves normally dry a brown or pinkish-brown colour on the lower surface.

*Distr.* Surinam, French Guiana.

4. *Tovomita grata* Sandwith sp. nov.; inter congeneros ob folia parva, flores fructusque pro rata magnos, sepala 4, petala 5 sepalis haud decussata, stamina valde numerosa filamentis longis tenuibus, stylis liberis longis distinguenda; a *T. Eggersii* Vesque, *T. umbellata* Benth. et *T. Riedeliana* Engl. floribus majoribus, staminibus numerosioribus longioribus, petalis 5 statim recedit; a *T. longicuneata* Engl., quae petalis 5 gaudet, forma foliorum longitudine filamentorum omnino abhorret; forsitan ad *T. Choisyana* Pl. et Tr. atque *T. obovatam* Engl. (§ *Chrysochlamydiaefoliae*) melius approximans, sed magnitudine atque nervatione foliorum primo visu differt.

*Arbor* parva, sed altitudine nonnunquam mediocri, ramulis summis subteretibus vel apicem versus compressis junioribus

laevibus levissime striatulis. *Folia* obovato-elliptica, elliptica vel oblanceolata, apice vulgo breviter vel brevissime satis late obtuse cuspidato-acuminata vel cuspidata vel acuminata, rarius obtusa tantum, basi acute cuneata, pro genere parva, 5–12 cm. longa, 2–5.5 cm. lata, rigide chartacea vel coriacea, siccitate vulgo brunnea vel nigrescentia, rarius olivacea, costa utrinque praesertim subtus elevata, nervis primariis lateralibus angulo lato necnon variabili patulis subrectis secus marginem ipsum in nervum marginalem mergentibus, ab aliis secundariis parallelis interjectis supra saltem saepius etiam infra vix distinguendis, omnibus cum reticulatione tertiaria supra vel impressis vel obviis subtus ut in *T. Eggersii* manifestis prominulis; petiolus 1–1.8 cm. longus. *Inflorescentiae masculae* e basi ipsa vel apice pedunculi brevis ternatim ramosae, ad 3.5 cm. tantum longae, ad 6 cm. latae; rami primarii 5–9 mm. longi; pedicelli 0.7–1.3 cm. longi; bracteolae basi connatim deciduae, ovatae, 1 mm. longae. *Alabastra* matura ovoideo-oblonga vel oblonga, siccitate brunnea, apice rotundata, haud vel raro sub-apiculata, 7–8 mm. longa, 4–5.5 mm. diametro. *Sepala* 4; duo exteriora coriacea, basi connata, lata ovata, 7–8 mm. longa, 6–8.5 mm. lata; duo interiora petaloidea, tenuiora, submembranacea, oblonga vel obovato-oblonga, 9–10 mm. longa, 4.25–4.75 mm. lata. *Petala* 5, alba, sepalis haud decussata, firma, oblonga, facie angusta, 7–10 mm. longa, 1.25–4 mm. lata, interiora exterioribus breviora ac angustiora. *Stamina* numerosa, circiter 70–90, haud valde inaequalia sed exteriora aliquantum breviora; filamenta linearia, tenuia, adulta evoluta 4.5–8 mm. longa; antherae circiter 0.5 mm. longae, filamentis paulum latiores. *Inflorescentia feminea* vulgo triflora, alabastris ovoideis maturis fere ad 1 cm. longis et 6 mm. latis. *Flores* masculis similes, petalis 5, staminodiis staminibus similibus. *Ovarium* longitudinaliter 10-costatum; styli 5, liberi, conspicui, ad 5 mm. longi, ovario plus minusve aequilongi, divergentes, flexuosi vel sigmoidei, haud articulati, stigmatibus linguiformibus haud conspicuis circiter 1.5 mm. longis terminati. *Fructus* plus minusve pyriformis, laevis nec carinatus, basin versus conspicue saepe longe (0.6–1.8 cm.) contractus, apice in collum vulgo insigniter angustum subconicum usque 1.5 cm. longum stylis terminatum attenuatus, 3.5–6.5 cm. longus, fere ad 3 cm. diametro; reliquiae floris sub fructu persistentes.

BRITISH GUIANA. Simuni Creek, Rupununi River, on gravelly soil on low hill, in miscellaneous forest, Aug. 1931, *Davis* in *Forest Dept.* no. 2143 (type), ♂. Kamwatta Creek, Koirimap River, Pomeroon River, in hilly land, July 1918, *Hohenkerk* in *Forest Dept.* no. 140 A, ♀; 140 B, ♂. Mazaruni Station, in old second-growth forest, June 1933, ♀ fl. and fr., *Tutin* 175 (Brit. Mus., Kew, type of fruit); *ibid.*, Sept. 1918, leaves and drawings of ♀ fl. and fr., *Leechman* XI. Bootooba, Demerara River, on sand-hill, fr. August 1924, *Persaud* 115.

. This, as it seems, very distinct species is noted as a small tree, about 30–60 ft. high, with stilt roots (*Davis*), and smooth grey

bark and yellow latex (*Tutin*). Davis described his ♂ flowers as white and strongly-scented, whereas the ♀ flowers of *Tutin*'s collection were noted as green and those of Persaud's as brown; in the latter collection the flowers were no doubt old and withered. In numerous characters, as may be seen from the key, this species approaches the very different-looking *T. Choisyana* and *T. obovata*.

5. *T. brevistaminea* Engl. l.c. 446, t. 96, f. 3, et l.c. 207; Vesque, l.c. t. 90 et l.c. 194; Eyma, l.c. 42 et l.c. 103.—*T. Jenmani* Engl. l.c. 447; Vesque, l.c. 202. *T. guianensis* Pl. et Tr. l.c. 268, quoad exempl. Schomburgk., non Aubl.

Pomeroon River, *Richard* and *Robert Schomburgk* 893 and 1401 (type no.), ♂; do., Kamwatta Creek, June 1918, *Hohenkerk* in *Forest Dept.* no. 727, ♂ and ♀; do., Dec. 1922, *la Cruz* 3174 (New York), ♀. Yarikita-Arawau River, North-west District, May 1929, *Martyn* 67, ♀. Barama River, North-west District, Dec. 1910, *C. W. Anderson* in *Forest Dept.* no. 962, ♀. Mount Terminus, Barima River, North-west District, May 1907, *Ward* and *Kortright* in *Jenman Herb.* no. 8652, ♀. Macouria River, Essequibo River, Nov. 1886, *Jenman* 2418, ♂. Mazaruni River, Sept. 1880, *Jenman* 659 (type of *T. Jenmani*), ♀.

From the evidence of field-notes this species is a large shrub or small tree reaching a height of about 20 ft.

*Distr.* Surinam. Brazil, according to Vesque.

Examination of the above specimens has led to the conviction that they represent a single species which is noteworthy for the globose, rounded-obtuse buds and the few, stout, club-shaped stamens with small anther-thecae widely separated by the connective. The fruits of our specimens are rather small and distinctive, 3 cm. long or often shorter ( $\pm$  4 cm., *Eyma*), up to 2 cm. diam., ovoid-subglobose or ovoid-ellipsoid, contracted at both ends but especially so at the apex. The material presents variability in two characters which calls for mention. In the first place, as with other species (cf. *T. cephalostigma*), the female inflorescence has much larger buds, sepals and petals, and longer filaments than the male. It was, no doubt, mainly owing to his failure to realise this natural condition in a *Tovomitia* that Engler was induced to describe a new species, *T. Jenmani*, on the evidence of a single collection with female inflorescence. Secondly, there is a perplexing variability in the angle and direction of the main lateral nerves of the leaves, which as usual are most easily examined on the lower surface. These nerves, which leave the midrib either at a wide or at a distinctly acute angle, may proceed to the margin in a line which is practically straight, or may curve up to it from almost half way. The extremes of this variability are met with in the type material of *T. brevistaminea* and *T. Jenmani*, so that Engler may well be excused for keeping them separate. The variability in the direction of the nerves of this species, coupled with the frequent prominence of the secondary lateral nerves, has led authors to place it among species of Vesque's

section *Clusiifoliae*, whereas it appears to fall quite as naturally into the *Chrysochlamydifoliae* near *T. Schomburgkii* and the true *T. guianensis*, a situation which renders untenable the present constitution of these sections.

6. ***T. Schomburgkii*** *Pl. et Tr.* l.c. 274 ; *Engl. l.c.* 448 et 207 ; *Vesque, l.c. tt.* 98, 99, et l.c. 212 ; *Sandwith, l.c.* 177 ; *Eyma, l.c.* 107.—*T. Schomburgkiana* et *T. hameliaefolia* Klotzsch in *Rich. Schomb. Reisen*, 3, 996 (1848), fide *Engl.*, nomina.

A small tree, apparently frequent in various types of coastal forest. Schomburgk's original collections were from the Pomeroun district. The species has recently been collected so far inland as the Simuni Creek, Rupununi district, by *Davis* in *Forest Dept.* no. 2128.

*Distr.* Surinam. Amazonian Brazil, fide *Eyma*.

In this well-marked species the resin-ducts are conspicuous on the lower surface of the leaves.

7. ***T. macrophylla*** *Walp. Rep.* 1, 392 (1842) ; *Pl. et Tr. l.c.* 279 ; *Engl. l.c.* 452 et l.c. 207 ; *Vesque, l.c. tt.* 101, 102, et l.c. 217. —*Marialvaea macrophylla* *Poepp. et Endl. Nov. Gen. et Sp.* 3, 14 (1845).

River-bank, Blue Mountain, Essequibo Co., August 1924, *Persaud* 118.

*Distr.* Amazonian Brazil and Venezuela.

The solitary collection cited above has branchlets, leaves and fruit only, and it is hoped that flowering material will eventually confirm the identification. As the name indicates, this is a species with large leaves, the smallest being at least 15 cm. long and 7 cm. wide ; the midrib and main lateral nerves are very conspicuously raised on the lower surface, which is also remarkable for the copious black dotting which, in *Vesque's* opinion, is caused by " lenticelles, compliquées d'une sécrétion résineuse." The ripe fruit of *Persaud* 118 at Kew is mutilated at the apex ; otherwise it is pearshaped, 3.7–4 cm. long and about 3 cm. diam., contracted into a broad base which is surrounded by the remains of the flower (cf. the fruits of *T. Choisyana* and *T. obovata*).

8. ***Tovomita*** (§ "*Chrysochlamydifoliae*") ***calodictyos*** *Sandwith*, sp. nov. ; *T. macrophyllae* *Walp.* affinis, praesertim foliorum venatione subsimili, sed nervis primariis satis longe a margine anastomosantibus nervo marginali conspicuo, pagina inferiore epunctata multo intricatius atque prominentius reticulata, floribus multo minoribus, petalis 4, staminibus paucioribus differt.

*Arbor* parva, ramulis summis glabris teretibus sed apicem versus compressis. *Folia* vulgo magna, elliptica vel elliptico-oblongata, apice longe (1.2–2 cm.) acute acuminata, basi acute cuneata vel obtusa vel fere rotundata, 15–31.5 cm. longa, 4.5–13.3 cm. lata, chartacea, glabra, subtus haud punctata, nervis venulisque omnibus



supra prominulis subtus prominentibus, nervis primariis numerosis utroque costae latere 16–22 prope medium folium a sese 1–2 cm. distantibus patulis tum nervo marginali conspicuo satis longe (prope medium folium vulgo 5–8 mm.) a margine ipso conspicue anastomosantibus et sursum arcuatis, nervis secundariis permultis aliis e costa angulo recto exorientibus tum abrupte versus primarios deorsum curvatis aliis numerosissimis inter primarios regulariter descendentibus plus minusve parallelis, omnibus cum venulis tertiariis utrinque rete intricatissimum formantibus; petiolus ad 2.5 cm. longus. *Inflorescentiae masculae* tantum visae, evolutae adultae ad 12.5 cm. longae, axi valde compresso nodis ternatim usque senatim ramoso, ramis ipsis similiter ramosis, pedicellis 4–8 mm. longis; bracteae delapsae; bracteolae alabastra involventes, membranaceae, pallide brunneae, ovatae, apice in apiculo alabastrum connatae, igitur cito calyptratim caducae. *Alabastra* ovoidea, apiculata, 4.5–6 mm. longa, ad 4.5 mm. diametro. *Sepala* 4; 2 exteriora crassa, valde concava, florem involventia, ovata, 5–7 mm. longa, 4–5.5 mm. lata; 2 interiora petaloidea, ovata, 5.5–6 mm. longa, ad 3.5 mm. lata. *Petala* 4, sepalis decussata, oblonga, firma, 5–7 mm. longa, 2.5–3 mm. lata. *Stamina* circiter 30, inaequalia; filamenta 2.5–4.5 mm. longa; antherae circiter 0.6 mm. longae, filamentis haud latiores.

BRITISH GUIANA. Tiger Creek, Essequibo River, Nov. 9th, 1930, *Brinsley* in *Forest Dept.* no. 1002 (type), 1003: a small tree, growing on brown sand.

A very distinct species on account of the large papery leaves with numerous widely separated main lateral nerves which anastomose at a conspicuous distance from the margin, the direction of the minor nerves which is very similar to that of *T. macrophylla*, and the comparatively small flowers.

9. ***T. Choisyana*** *Pl. et Tr.* l.c. 281; *Engl.* l.c. 208; *Eyma*, l.c. 45 et l.c. 106.—*Micranthera clusioides* Choisy in *Mém. Soc. Hist. Nat. Paris*, 1, 210 (1823–24), partim excl. syn. Rich.

Kamwatta Creek, Koirimap River, Pomeroun River, July 1918, *Hohenkerk* in *Forest Dept.* no. 453A, 453B, both ♀ with fl. and fr. *Distr.* Guiana.

Some doubt attaches to the above identification since the material is incomplete. It has been compared with *Eyma*'s recent description and with Surinam specimens cited by him. *T. Choisyana* might be confused with *T. Schomburgkii* ♀ but should be distinguished, in addition to characters given in the key, by the styles being not articulate below the stigmas. It is in reality very closely allied to the next species.

10. ***T. obovata*** *Engl.* l.c. 451 et l.c. 207; *Vesque*, l.c. 220.—? *T. macrophylla* Klotzsch, l.c., nomen.

Pomeroun River, *Richard* and *Robert Schomburgk* 878 and 1365B (type nos.); July, 1918, *Hohenkerk* in *Forest Dept.* no. 728. **Weri-220**

Werai-Kuru Creek, Essequibo River, April 1922, *Hohenkerk* in *Forest Dept.* no. 453C. Moraballi Creek, Essequibo River, Sept. 1929, *Sandwith* 349. Karaow Creek, Mazaruni Station, Sept. 1918, *Leechman* XII. Yampari Creek, 20 miles S.W. of Georgetown, May 1929, *Forest Dept.* no. 938. Christianburg, Demerara River, Feb. 1910, C. W. *Anderson* in *Forest Dept.* no. 453.

*Distr.* At present recorded only from British Guiana. The *T. obovata* of Pulle's Enum. Pl. Surinam, p. 307 (1906) is referred by Eyma to *T. Choisyana*.

This fine species, the Broad-leaved or Large-leaved Awasakuli, is easily known by its large leathery leaves and large flowers. It is strongly and conspicuously stilt-rooted, and sometimes grows to a considerable height, but it is rarely a tree of timber size, and the diameter above the stilts does not normally exceed a foot. The blaze yields a thick, pale yellow or café-au-lait latex. Although this species is frequent on the banks of small creeks and gullies it is not, according to the Forest Department, typically a swamp tree.

The fruit of *T. obovata* (see *Forest Dept.* 453C.) is very similar to that of *T. Choisyana* as described by Eyma (and see *Forest Dept.* 453 A, B) ; it is, in fact, difficult to find good and mutually exclusive characters for distinguishing these two species. In addition to the shape, texture and venation of the leaves, one may perhaps use, on present evidence, the longer, stouter male inflorescence, with larger, more ovoid, and usually distinctly apiculate buds, of *T. obovata*.

## XXII—AFRICAN ORCHIDS: VIII\* V. S. SUMMERHAYES.

***Disa* (§ *Calostachys*) *subaequalis* Summerhayes, sp. nov. ; affinis *D. Schimperi* N.E.Br. et *D. Welwitschii* Rchb. f., ab illa planta graciliore, petali lobo postico antico paulo tantum longiore lanceolato subacuto, ab hac inflorescentia longiore, petali lobo postico lanceolato subacuto nec dilatato rotundato differt.**

Herba terrestris, 20–70 cm. alta ; tuber ovoideum, 2.5 cm. longum, 1.5 cm. diametro ; caulis fertilis erectus, gracilis vel crassiusculus, per totam longitudinem vaginis ovatis vel lanceolatis inferioribus obtusis superioribus acuminatis foliaceis supremis bracteiformibus obtectus. *Folia* e caule sterili brevi 6–7 cm. longo orta, linearia, acuta, 15–30 cm. longa, 6–13 mm. lata. *Inflorescentia* cylindrica, dense vel subdense multiflora, 7–20 cm. longa, 2–3.5 cm. diametro ; bracteae lanceolatae, acuminatae, floribus aequilongae vel inferiores flores superantes ; pedicellus cum ovario 1–1.5 cm. longus. *Flores* suberecti, rosei vel purpurascentes. *Sepalum* intermedium erectum, vix unguiculatum, elliptico-obovatum, obtuse rotundatum, 6–9 mm. longum, 4–7 mm. latum, valde concavum, infra medium calcar pendulo apicem versus leviter dilatato 4–7 mm. longo instructum ; sepala lateralia patentia, elliptica vel oblongo-

\* Continued from K.B. 1935, 204.

elliptica, subacuta usque rotundata, basi leviter obliqua, 7–12 mm. longa, 3·5–6·5 mm. lata. *Petala* erecta, ambitu auriculiformia, basi margine postico columnae adnata, valde obliqua, margine antico  $\pm$  cordata, dimidio superiore bilobata, lobo postico lanceolato vel oblongo-lanceolato subacuto 1·5–4 mm. longo, lobo antico postico brevior semiorbiculari rotundato, petala tota 5·5–8 mm. longa, 3·5–5 mm. lata. *Labellum* pendulum, simplex, lanceolato-vel oblanceolato-lineare, acutum, 6–10 mm. longum, 0·7–0·9 mm. latum. *Anthera* erecta, 3·5–4·5 mm. alta, loculis parallelis; rostellum lobus intermedius triangularis, obtusus; stigma pulvinatum, fere orbiculare.

NORTHERN NIGERIA. Vom, Bauchi Plateau, in swamps, 900–1350 m., *Dent Young*.

SOUTHERN NIGERIA. Bamenda District, Basenako to Lakom, on grassy stony slope, 1500–1800 m., June 1931, *Maitland* 1545; 1616; Bamenda District, no exact locality, *Johnstone*.

UGANDA. Masaka, Sango Bay, on boggy land, 1100 m., Oct. 1925, *Maitland* 911; Kyagwe, near Ntakafumu, in grassy stretch, 1200 m., April 1914, *Dummer* 738 (type); Lira, July 1931, *Hancock* 2224.

KENYA COLONY. Nandi, in swamp, 1950 m., Aug. 1933, *Dale* 3167a; Trans-Nzoia, swamps, 1800–1900 m., June 1932, *Tweedie* 35, July 1932, *Tweedie* 40. Kipkarren, in wet ground, June and July, *Brodhurst Hill* 69, 70; Londiani, in grasslands, 2280 m., July 1932, *Graham* 2883.

TANGANYIKA TERRITORY. Bukoba, Jan. 1934, *Mainwaring*, (Coryndon Museum, Nairobi, No. 6006); Bukoba, Ngono swamp, Uganda Road, 1200 m., Jan. 1932, *Haarer* 2433.

This is clearly a common plant of swamps and wet grasslands at moderate altitudes around Lake Victoria. The colour of the flowers varies from pink to various shades of mauve and magenta.

***Nervilia Afzelii* Schltr.** in Engl. Bot. Jahrb. 45, 402 (1911), var. ***grandiflora* Summerhayes**, var. nov.; a typo flore 2 cm. longo differt.

FRENCH GUINEA. Faranna, May 1905, *Chevalier* 13406.

Characterised by the much larger flower, which, however, has the same structure as that of the type. This plant has been named *Pogonia Fineti* by A. Chevalier in Explor. Bot. Afr. Occ. Franç. 1, 620 (1920), but without any description.

***Auxopus kamerunensis* Schltr.** in Engl. Bot. Jahrb. 38, 4 (1905), var. ***grandiflora* Summerhayes**, var. nov.; a typo floribus 6–7 mm. longis differt.

IVORY COAST. Makougnié railway station, at 75 kilometre point, Jan. 1907, *Chevalier* 17025.

#### EULOPHIA R.Br.

After many years of study of this genus and of the allied genus *Lissochilus* R.Br. I have come to the conclusion that they cannot be

kept distinct, at all events, as at present constituted. There are undoubtedly tendencies among the African species of *Eulophia* for the sepals and petals to be unlike in shape, size and colour, for the former to become reflexed to varying degrees and for the lip to be pandurate with the lateral lobes or basal auricles rounded and more or less enveloping the column. Most of the groups showing these features to various extents have been classed as *Lissochilus*, but in my opinion these do not represent a natural genus. The "genus" rather consists of the end members of a number of series starting from different basic points within the genus *Eulophia* and evolving along parallel lines of development.

It is interesting to note that the divergence between sepals and petals has not always progressed in the same direction. In many groups referred usually to *Lissochilus* the petals are distinctly longer as well as broader than the sepals in addition to being differently coloured. In the large group of species allied to *Eulophia longisepala* Rendle, including, for instance, *E. triceras* Schltr., *E. Stolzii* Schltr. and *E. brevipetala* Rolfe, the sepals are much longer and narrower than the petals and are somewhat reflexed. This group, however, has always been included in *Eulophia*, although it is difficult to see how it can be excluded technically from *Lissochilus*. On the other hand *E. cristata* Steud. (*Lissochilus purpuratus* Lindl.), which is always included in *Lissochilus* by those who maintain that genus, has the sepals and petals only slightly different in shape and colour although the sepals are certainly reflexed.

It therefore seems most logical to include all the species of *Lissochilus* in *Eulophia* until it is possible to carry out a complete revision of *Eulophia*. It may then be possible to divide the genus into separate groups one of which may be a reconstituted *Lissochilus*.

***Eulophia oedoplectron*** Summerhayes, nom. nov. *Lissochilus macranthus* Lindl. Gen. & Sp. Orch. 191 (1833). *L. elatus* Rolfe in Dyer, Fl. Trop. Afr. 1, 87 (1897).

Since the trivials *elata* and *macrantha* have been used already in *Eulophia* a new name is necessary for this species. The differences between the two species as given by Rolfe are largely a matter of degree; there are no real structural differences.

***E. latilabris*** Summerhayes, nom. nov. *Lissochilus Schweinfurthii* Rchb. f. Otia Bot. Hamburg. 1, 60 (1878).

Owing to the existence of *E. Schweinfurthii* Kraenzl. a new trivial is needed for the above species. The very broad lip is a characteristic feature of the species.

***E. Horsfallii*** Summerhayes in Hutch. and J. M. Dalz. Fl. W. Trop. Afr. 2, 444 (1936). *Lissochilus Horsfallii* Batem. in Bot. Mag. t. 5486 (1865). *L. roseus* Lindl. in Bot. Reg. 1843, Misc. p. 25, quoad descr., non *Dendrobium roseum* Sw.

*Dendrobium roseum* Sw. is a synonym of *Polystachya galeata*

Rchb. f. and the combination *Lissochilus roseus* (Sw.) Lindl. (based on *D. roseum*) must therefore be retained for the same species, although Lindley had quite a different plant in mind. After examining a large number of species I have been unable to find any satisfactory differences between *L. Horsfallii* and *L. roseus*. In some specimens the lip and sepals are relatively narrower and the sepals have a longer acumen or apiculus than in others, but many intermediates occur and sometimes the lip and sepal characters are not correlated.

Among the specimens referred to *L. roseus* in the Kew Herbarium there are, however, a number in which there is good correlation between several characters, viz. small flowers, very blunt sepals not much narrowed towards the base and a constantly shaped lip. This seems to be a new species which I am accordingly describing below. It will be seen that although the flowers are always smaller than in *E. Horsfallii* the inflorescence is equally tall; there is therefore no likelihood of the species representing a series of starved or poorly developed specimens.

**E. Barteri** Summerhayes, sp. nov.; affinis *E. Horsfallii* (Batem.) Summerhayes, a qua floribus minoribus, sepalis cuneato-obovatis obtusis basi sensim angustatis differt.

Herba terrestris, paludicola. *Tubera* ignota. *Caulis* pseudo-bulbosus, plurifolius. *Folia* longe petiolata, lanceolata, acutissima, in toto 40-100 cm. longa, 3-8 cm. lata, plicata. *Scapus* erectus, robustus, teres, 1-2 m. altus, pedunculo vaginis elliptico-ovatis obtusis vel apiculatis remotis instructo; racemus 15-35 cm. longus, multiflorus; bracteae e basi angusta obovatae vel oblanceolatae, longe apiculatae vel breviter acuminatae, 1-2.5 cm. longae, usque ad 1 cm. latae. *Flores* erecto-patentes, purpurei vel partim albi; ovario pedicellato 2-3 cm. longo. *Sepala* cuneato-obovata, obtusa, lateralia leviter obliqua, valde reflexa, 13-17 mm. longa, 5-8 mm. lata. *Petala* orbiculari-elliptica vel saepius fere orbicularia, apiculata, 13-18 mm. longa, 12-17.5 mm. lata. *Labellum* trilobum, 16-24 mm. longum, 15-24 mm. latum; lobi laterales  $\pm$  semiorbiculares, margine antico leviter truncato; lobus intermedius obovato-oblongus, obtusus vel rotundatus, 8-12 mm. longus, 8-13 mm. latus; labelli discus medio carinis tribus semicircularibus antice in carinas humiles  $\pm$  verrucosas usque ad dimidium lobi intermedii decurrentibus instructus; calcar conicum, acutum, 4-6 mm. longum. *Columna* leviter incurvata, 8-10 mm. longa. *Anthera* conico-hemisphaerica, breviter bicornis; pollinia ovoidea, 1.8 mm. longa, stipite oblongo-ovato, viscidio leviter lunato utrinque acuto.

SIERRA LEONE. Northern Province, Mapaki, swamp, Aug. 1928, *Deighton* 1213; Giema, marshes, frequent, Nov. 1926, *Deighton* 364; Bobobu, swamp, June 1918, *Aylmer* 607; no locality, *Smythe*.

IVORY COAST. Near Férédougouoa River, by path to Touba, 525 m., July 1926, *Collenette* 66.

GOLD COAST. Kintampo, in swampy areas, 330 m., July 1935, *Vigne* 3935.

NORTHERN NIGERIA. Nupe, margin of a swampy ravine, *Barter* 1481 (type) ; Sare, side of a rivulet, *Barter* 3429.

**E. caricifolia** *Summerhayes* in Hutch. and J. M. Dalz. Fl. W. Trop. Afr. 2, 444 (1936). *Lissochilus caricifolius* Rchb.f. in Linnaea, 41, 74 (1877). *L. longifolius* Benth. in Hook. Niger Flora, 530 (1849).

The name *Eulophia longifolia* being already in use for another species it is necessary to adopt the trivial "*caricifolia*" for this species. In the Flora of Tropical Africa Rolfe states of *L. caricifolius* "it is said to be allied to *L. longifolius* Benth. but the lip is very different." Reichenbach's description appears to me to fit very well the lip in our species and I feel that Rolfe's opinion is merely a matter of misinterpretation of the author's meaning. The number of keels on the middle lobe of the lip varies from 3-7 although there are only three in the lower part of the lip.

**E. involuta** *Summerhayes*, nom. nov. *Lissochilus Smithii* Rolfe in Dyer, Fl. Trop. Afr. 7, 96 (1897).

The existence of *Eulophia Smithii* Rolfe on p. 54 of the above work renders a new name necessary for the species under consideration. This is the first record from West Africa of a member of the yellow-flowered group of species. The name is given in allusion to the rolled-up narrowly linear leaves.

**E. Millsoni** *Summerhayes* in Hutch. & J. M. Dalz. Fl. West Trop. Afr. 2, 446 (1936). *Lissochilus Millsoni* Rolfe in Dyer, Fl. Trop. Afr. 7, 79 (1897). *L. lacteus* Kraenzl. in Engl. Jahrb. 43, 398 (1909). *L. Andersoni* Rolfe in Kew Bull. 1910, 159. *L. Johnsoni* Rolfe, l.c. 160. *Eulophia tuberifera* Kraenzl. in Engl. Jahrb. 28, 169 (1900).

I have no doubt after examination of type specimens and descriptions that all the above "species" are conspecific. The number of verrucose keels on the middle lobe of the lip varies considerably while they may be either the same colour as the ground colour of the lip or tinged mauve or reddish. The spur also may sometimes be a little longer and more acute in some individuals than in others. In other respects there is no structural difference whatever between the various specimens.

**Rhipidoglossum laxiflorum** *Summerhayes*, sp. nov. ; a *R. xanthopollinio* (Rchb. f.) Schltr. floribus minoribus, calcaribus multo brevioribus, a *R. rutilo* (Rchb. f.) Schltr. foliis angustioribus, floribus laxioribus, calcaribus multo brevioribus, a *R. Peglerae* (Bolos) Schltr. foliis angustioribus, labello et calcaribus minoribus, pollinibus stipitibus brevioribus et crassioribus differt.

Herba epiphytica, parva, caule suberecto 4-5 cm. longo 2-3 mm. diametro apice plurifoliato. *Folia* ligulato-lineariter, inferne leviter angustata, apice breviter inaequaliter obtuse vel subacute bilobata, 4-11 cm. longa, 5-9 mm. lata. *Inflorescentiae* suberectae, leviter flexuosae, 4-11 cm. longae, usque 20-florae ; bracteae minutae, vaginiformes,  $\pm$  truncatae ; pedicelli cum ovaribus 1-2 mm. longi.

*Flores* subpatentes, 4-6 mm. distantes, viridi-albi. *Sepalum* intermedium ellipticum, apice rotundatum, 1.7 mm. longum, 1.3 mm. latum; sepala lateraliter oblique elliptico-ovata, apice rotundato-obtusa, 2 mm. longa, 1.2 mm. lata. *Petala* fere orbicularia, vix 2 mm. longa et lata. *Labellum* transverse elliptico-oblongum, basi in calcar sensim transiens, apice breviter et late apiculatum, 1.6 mm. longum, 2.7 mm. latum; calcar cylindricum, medio leviter constrictum, incurvatum, 1.8 mm. longum. *Columna* brevis, dorso semiteres, 1 mm. longa; anthera non visa; pollinii stipites 2, separati, versus basin angustati; viscidia 2, distincta, elliptica; rostellum productum, integrum, acutum.

IVORY COAST. Country of the Dyolas, summit of Mt. Goula near Danané, 445 m., April 1909 (in fruit), *Chevalier* 21213.

GOLD COAST. Aburi Gardens, on coffee trees, March, 1902, *Johnson* 858 (type).

A rather insignificant species remarkable chiefly on account of the very small flowers with short spur only a little longer than the lip, combined with a relatively lax-flowered inflorescence and narrow leaves. The orbicular petals and the lip much broader than long show it to be a typical member of the genus.

***Rhipidoglossum longicalcar*** *Summerhayes*, sp. nov.; affine *R. rutilo* (Rchb. f.) Schltr., a quo foliis acutis, labello longiore quam lato apice leviter emarginato, calcari plus quam 1 cm. longo, viscidiiis majoribus satis distinguendum.

Herba epiphytica, caule erecto vel repente 5-6 cm. longo usque 8-foliato inferne radicibus flexuosis glabris instructo. *Folia* vaginis arcte imbricatis, lineari- vel oblongo-oblancoolata, interdum leviter curvata, apice inaequaliter et obscure bilobata, lobo longiore acuto brevior fere nullo, 7-13 cm. longa, 6-16 mm. lata. *Inflorescentiae* patentes vel subpendulae, graciles, 5-15 cm. longae, fere per totam longitudinem subaxe multiflorae. *Flores* patentes, pallide virides. *Sepalum* intermedium ellipticum, rotundato-obtusum, 2.5-3 mm. longum, circiter 1.5 mm. latum; sepala lateraliter oblique oblonga, obtusa, circiter 3.7 mm. longa, circiter 1.5 mm. lata sed intermedio paulo angustiora. *Petala* orbiculari-ovata, apice rotundata, leviter obliqua, circiter 2.3 mm. longa et lata. *Labellum* e basi angusta quadratum, antice angustatum, apice truncatum et leviter retusum interdum apiculo in sinu interjecto praeditum, 3-3.5 mm. longum, 2-2.5 mm. latum; calcar e basi latiore anguste cylindricum, obtusum, 11-14 mm. longum. *Columna* brevis, apice valde dilatata, 1 mm. longa; anthera non visa, delapsa; pollinia ellipsoidea, stipitibus 2 linearibus superne paulo latioribus 0.5 mm. longis, viscidiiis 2 distinctis curvato-ellipticis 0.4 mm. longis instructa.

SOUTHERN NIGERIA. Oban District, no exact locality, 1911, *Talbot* 937; Kwa River, Obutong Beach, common, *Talbot* 939 (type). (Both specimens in Herb. Mus. Brit.).

This rather interesting species is characterised by the quadrate lip, which is longer than broad and truncate at the apex, the two

angles being acute and slightly curved outwards and the shallow sinus sometimes being furnished with an apiculus, and by the long slender spur. In other species of *Rhipidoglossum* which I have examined the lip is broader than long, but the floral structure is otherwise very similar to that of *R. longicalcar*.

**Rangaeris** *Summerhayes*, gen. nov.

Sepala et petala e basi conniventia  $\pm$  patentia, lanceolata,  $\pm$  inter se similia; sepala lateralia rarius e pede columnae exorta. *Labellum* sepalo intermedio vulgo simile sed saepius latius, lanceolatum vel ovatum, rarius basi trilobum lobis lateralibus brevibus rotundatis; calcar ex ore saepius angusto cylindricum nec dilatatum. *Columna* brevis vel longiuscula, apoda vel pede brevi instructa; rostellum deorsum productum, primo indivisum, viscidio amoto bi-vel trilobum. *Anthera* cucullata, in rostrum latum obtusum vel truncatum producta; pollinia globosa vel ellipsoidea, stipitibus 2 distinctis linearibus vel oblanceolatis, viscidio communi saepius quadrato vel cordato vel viscidii 2  $\pm$  distinctis parvis ellipticis instructa.

Plantae epiphyticae; caulis  $\pm$  elongatus vel rarius brevissimus, bene foliatus; folia coriacea, ligulata vel oblanceolata, acuta, obtusa vel inaequaliter bilobata; inflorescentiae racemosae, suberectae vel arcuato-patentes, sublaxe pluri- vel multiflorae; flores parviusculi vel rarius majusculi, albi vel flavidi, erecto-patentes vel patentes, pedicello cum ovario bracteam superante.

Species circiter 16 adhuc notae, Africae tropicae et insulae Madagascariae indigenae.—*Aerangis* Rchb.f., Sect. *Rangaeris* Schltr. in Beih. Bot. Centralbl. 36, II, 113, 121–123 (1918).

Species typica.—*R. muscicola* (Rchb.f.) Summerhayes.

When Schlechter first elaborated the genus *Aerangis*, in his account of the Angraecoid Orchids (see above), he divided it into two sections, namely, *Eu-Aerangis*, characterised by a single stipes to the pollinia, and *Rangaeris*, in which each pollinium has its own stipes, there being either a common viscidium or more rarely two separate ones. An examination of the species shows that there are other characters associated with these, the members of the two sections being readily recognisable on inspection.

Recently I have come across a number of other species, several new to science, others omitted altogether by Schlechter, which apparently fall into the second section. On careful examination I have decided that it is more logical to separate this section as a distinct genus since the species really show little resemblance to *Aerangis* proper but in some ways approach other genera. The genus *Aerangis*, as now restricted to Schlechter's section *Eu-Aerangis*, is a well-defined and very natural group. The separation of *Rangaeris* is therefore justified on these grounds alone; its inclusion in *Aerangis* would always make difficult any exact definition of that genus. On the other hand *Rangaeris* is a rather heterogeneous assemblage composed of several groups of closely allied species. Whether it will



be possible to maintain it when further discoveries, which are inevitable, are made and further investigations have been carried out, is open to question. As the detailed classification of the Angraecoid Orchids is still a matter for considerable investigation I do not propose to allocate to *Rangaeris* any exact position in Schlechter's scheme.

I have already (Hutch. & J. M. Dalz. Fl. West Trop. Afr. 2, 449: 1936) transferred four species to *Rangaeris*, namely, *R. longicaudata* Summerhayes (*Mystacidium longicaudatum* Rolfe), *R. muscicola* Summerhayes (*Aëranthus muscicola* Rchb.f.), *R. rhipsalisocia* Summerhayes (*Angraecum rhipsalisocium* Rchb.f.) and *R. Dorotheae* Summerhayes (*Angraecum Dorotheae* Rendle). The following new combination should also be made :—

***Rangaeris brachyceras* Summerhayes, comb. nov.** *Aerangis brachyceras* Summerhayes in Kew Bull. 1934, 213.

I do not propose to transfer formally the remainder of the species of *Aerangis* sect. *Rangaeris* to the new genus as I have not seen a few of them and am doubtful of the specific distinctness of the others. The descriptions of two new species follow.

***Rangaeris biglandulosa* Summerhayes, sp. nov.**; affinis *R. brachycerati* Summerh., a qua foliis latioribus, perianthii segmentis acutioribus, columna pede fere 1 mm. longo sepala lateraliter gerente instructa, viscidiiis distinctis distinguitur.

Herba epiphytica; caulis brevis, erectus, circiter 4-5 cm. longus, inferne radicibus numerosis flexuosis dense pubescentibus instructus, apice circiter 5-foliatus. *Folia* suberecta, basi imbricata et breviter vaginantia, oblongo-ligulata, dimidio inferiore sensim angustata, apice obtuse inaequaliter bilobata sinu parvo vel subnullo, 9-14 cm. longa, 14-17 mm. lata. *Inflorescentiae* erectae vel suberectae, foliis aequilongae vel paulo breviores, sublaxe multiflorae; pedunculus gracilis, 3-4 cm. longus, vaginis 1-2 arctis instructus; rhachis gracilis; bractae lanceolatae vel ovato-lanceolatae, acutae, 1-4 mm. longae; ovarium cum pedicello 5-6 mm. longum. *Sepalum* intermedium oblongo-lanceolatum, breviter acuminatum, 5.5-6 mm. longum, 1.5 mm. latum; sepala lateraliter columnae pedi affixa, subfalcatis lineari-lanceolata, acuta, 6.5 mm. longa, 0.8 mm. lata. *Petala* oblique triangulari-lanceolata, acuta, 5.5-5 mm. longa, 1.7 mm. lata. *Labellum* concavum, explanatum ovato-lanceolatum, breviter acuminatum, 6 mm. longum, 2-2.5 mm. latum; calcar fere rectum, e basi lata constrictum, dimidio superiore leviter clavato-inflatum, 5.5 mm. longum. *Columna* fere teres, 1.7 mm. longa, pede 0.7 mm. longo. *Anthera* hemisphaerica, antice producta; pollinii stipites lineares, inferne leviter angustati; viscidia distincta, elliptica. *Rostellum* trilobum, lobo intermedio lanceolato-lineari lateralibus triangularibus leviter incurvatis fere duplo longiore.

FRENCH GUINEA. Futa Djalón, plateau of Dalaba, Diaguissa, 1000-1300 m., Oct. 1907, *Chevalier* 18782 (Type in Herb. Mus. Paris.).

This is an extremely interesting discovery. The species is allied to *R. brachyceras* Summerhayes, but differs in a number of features as shown in the diagnosis, the most important being the very marked foot to the column, on which are borne the lateral sepals and the anticones of the petals, there being no vestige of such a foot in *R. brachyceras*. I have previously had difficulty in finding a foot to the column in some species of *Rhipidoglossum*, a genus said by Schlechter to possess one; this and other evidence have made me suspect that the presence or absence of a foot is not of generic significance in Angraecoid orchids. The discovery of *Rangaeris biglandulosa* gives to this opinion much greater weight, since this species and *R. brachyceras* can scarcely be placed in separate genera without ignoring the very important features they have in common.

It seems probable that the group of genera separated out by Schlechter on account of the supposed diagnostic importance of the foot of the column will have to be reconsidered together with other genera which closely resemble them but which were placed in other groups by Schlechter.

***Rangaeris trilobata* Summerhayes, sp. nov.**; ab omnibus generis speciebus labello basi trilobato lobis fere orbicularibus crenatis differt.

Herba epiphytica, scandens; caulis fere strictus, usque ad 60 cm. vel ultra longus, 2.5–3.5 mm. diametro, distanter foliatus, radices numerosas flexuosas ramosas emittens. *Folia* subpatentia, vaginis haud imbricatis, oblongo vel elliptico-lanceolata, 3–5 cm. distantia, apice acuta interdum breviter bifida, leviter recurvata, 6–8 cm. longa, 1–1.7 cm. lata. *Inflorescentiae* patentes, graciles, flexuosae, 3–5 cm. longae, 3–4-florae; bracteae late ovatae, subacutae; pedicelli cum ovariis circiter 1 cm. longi. *Sepalum* intermedium lanceolatum, apice late et obtuse acuminatum, circiter 7.5 mm. longum et 3 mm. latum; sepala lateralia intermedio similia sed inferne obliqua, 8.5 mm. longa, 2.7 mm. lata. *Petala* anguste lanceolata, acuta, paulo curvata, 7.5 mm. longa, 1.5 mm. lata. *Labellum* e basi brevi angusta trilobatum, 8.5 mm. longum, circiter 4.5 mm. latum; lobus intermedius lanceolatus, anguste sed obtuse acuminatus, 7 mm. longus, basi 1.5 mm. latus; lobi laterales orbiculares vel orbiculari-ovati, leviter crenati, ab intermedio angulo fere recto divergentes, circiter 1.5 mm. longi et lati; calcar gracile, cylindricum, circiter 5 cm. longum. *Columna* subteres, 3.5 mm. longa; anthera non visa; pollinia globosa, stipitibus duobus fere filiformibus circiter 2 mm. longis, viscidio communi fere oblongo postice bifido plus quam 1 mm. longo instructa; rostellum deorsum productum, trifidum, partitionibus subaequilongis intermedia lineari.

SOUTHERN NIGERIA. Eket district, 1912–13, *Talbot* 3299 (type in Herb. Mus. Brit.; paratype in Herb. Kew.).

A very remarkable species which approaches most nearly in vegetative characters to *R. longicaudata* (Rolfe) Summerhayes, but has much smaller leaves and flowers. In fact it resembles very closely

*Solenangis scandens* Schltr. and *Dinklageella liberica* Mansf. in its long climbing stems and distantly placed narrowly-elliptical or lanceolate leaves, but is totally different from each in flower-structure. In this latter feature, with the exception of the trilobed lip, it agrees with *Rangaeris muscicola* (Rchb.f.) Summerhayes and *R. rhipsalisocia* (Rchb.f.) Summerhayes, especially in the column, pollinia and rostellum. The trilobed lip separates *R. trilobata* from all other species in the genus; on the other hand its general shape and texture do not in the least recall to mind such genera as *Tridactyle* and *Angraecopsis* where the lip is usually trilobed.

**Angraecum** (§ **Eu-Angraecum**) *Chevalieri* Summerhayes, sp. nov.; affine *A. multinominato* Rendle, a quo foliis lateribus fere parallelis, inflorescentiis duplo longioribus laxifloris, tepalis acuminatis, calcar apicem versus leviter inflato tantum differt.

Herba epiphytica, caule erecto 6–11 cm. longo per totam longitudinem foliato circiter 3 mm. diametro. *Folia* basi paulo imbricata, lineari-ligulata vel oblongo-linearia, basi leviter angustata, apice inaequaliter obtuseque bilobata, lobis interdum leviter divaricatis, 4–7 cm. longa, 6–10 mm. lata. *Inflorescentiae* suberectae, 3–4-florae; rhachis gracilis; bracteae late ovatae, basi vaginantes, acutae vel breviter acuminatae, 2–4 mm. longae; pedicellus cum ovario fere 2 cm. longus. *Sepala* lanceolata, acuminata, lateralia leviter obliqua, circiter 1 cm. longa, 2 mm. lata. *Petala* anguste lanceolata, acuminata, sepalis paulo breviora, 1–2 mm. lata. *Labellum* ellipticum, apice subito acuminatum, 7–5 mm. longum, 3 mm. latum, medio carina humili instructum; calcar filiforme, dimidio superiore leviter clavato-inflatum, leviter recurvatum, 16–17 mm. longum. *Columna* brevis, circiter 2 mm. longa; anthera non visa; rostellum fere usque ad basin bifidum, vix productum.

IVORY COAST. Haut Sassandra, Toura country, between Sogui and Koualé, May 1909, *Chevalier* 21690 (type in Herb. Mus. Paris.).

A small species with few-flowered inflorescences and almost parallel-sided leaves. It is clearly related to *A. multinominatum* Rendle and similar species.

**Angraecum** (§ **Eu-Angraecum**) *pyriforme* Summerhayes, sp. nov.; affine *A. Egertonii* Rendle, a quo foliis anguste elliptico-oblongis duplo longioribus, labello ovato acuto, calcar brevior apice in saccum ellipsoideum dilatato differt.

Herba epiphytica, caule repente vel adscendente usque ad 11 cm. longo 2–4 mm. diametro superne foliato inferne radicibus flexuosis glabris instructo. *Folia* vaginis imbricatis, anguste oblonga vel elliptico-oblonga, leviter curvata, basi leviter angustata, apice inaequaliter et obtuse bilobata, lobis leviter conniventibus, 7–11 cm. longa, 1–2.2 cm. lata. *Inflorescentiae* suberectae, 2–4-florae, 2–4 cm. longae; pedunculus 1–2 cm. longus, basi vagina tubulosa 2–3 mm. longa praeditus; bracteae lanceolatae vel ovatae, pedicello cum ovario 7–12 mm. longo multo breviores. *Flores* suberecti, pallide

virides. *Sepalum* intermedium elliptico-lanceolatum, subacutum, circiter 10 mm. longum et 2.5 mm. latum; sepala lateralialia leviter curvato-lanceolata, acuta, 9 mm. longa, 2-2.5 mm. lata. *Petala* falcatis oblongo-lanceolata, subacuta, circiter 8 mm. longa et 1.5 mm. lata. *Labellum* e basi angusta ovatum, acutum vel breviter acuminatum, 7.5 mm. longum, 4.5 mm. latum, carina humilis mediana e basi usque supra medium decurrente instructum; calcar dimidio inferiore gracile, superiore ellipsoideo-dilatatum, obtusum, 11-11.5 mm. longum. *Columna* brevis, crassa; anthera hemisphaerica, antice breviter subacuta producta; pollinia pyriformia, stipitibus 2 oblanceolato-ligulatis, viscidii 2 distinctis oblongo-ellipticis instructa; rostellum profunde bifidum.

SOUTHERN NIGERIA. Oban district, 1911, *Talbot* 888 (type); Ijebu Province, Shasha Forest Reserve, on twig of undergrowth tree in primary rain forest, May 1935, *Richards* 3476. (both specimens in Herb. Mus. Brit.).

A not very striking member of § *Eu-Angraecum* closely related to several other West African species. It is probably most closely related to *A. Egertonii* Rendle from which it differs by the characters given in the diagnosis.

***Microcoelia microglossa* Summerhayes, sp. nov.; *M. caespitosae* (Rolfe) Summerh. similis, sed sepalo intermedio suborbiculari, sepalis lateralibus magis obliquis, calcar fere duplo longiore, columna multo brevior crassa, rostellum brevissimum, pollinii stipite brevi superne valde dilatato, viscidio reniformi-elliptico facile distinguendum.**

Herba epiphytica, aphylla. *Caulis* brevissimus, erectus, usque ad 1 cm. longus, radices numerosas ramosas flexuosas glabras emittens. *Inflorescentiae* suberectae, graciles, circiter 5 cm. longae, circiter 12-florae; pedunculus 12 mm. longus, vaginis tribus arctis distantibus instructus; bractae vaginiformes, obtusae, 1-1.5 mm. longae; pedicellus cum ovario tenuis, 6-10 mm. longus. *Flores* patentes. *Sepalum* intermedium suborbiculare, apiculatum, 2.3 mm. longum, 2.2 mm. latum; sepala lateralialia valde oblique triangulari-ovata, acuta, 3 mm. longa, 2.8 mm. lata. *Petala* lanceolato-ovata, acuta, leviter curvata, 2.2 mm. longa, 1.3-1.4 mm. lata. *Labelli* lamina parva, triangulari-ovata, acuta, basi utrinque lobulo minuto instructa, 2 mm. longa, 1.3 mm. lata; calcar lamina multo majus, ore fere 2 mm. diametro, e basi apicem versus per quadrantes tres inferiores sensim attenuatum, tum subconico-dilatatum, totum 1.5-2 cm. longum. *Columna* brevis, leviter incurvata, fere 2 mm. longa. *Anthera* semiglobosa, antice truncata; pollinii stipes circiter 1 mm. longus, basi angustissimus, sursum valde dilatatus rhombiformis, viscidium reniformi-ellipticum, stipite triplo brevius. *Rostellum* antice productum, breve, bilobum, lobis subacutis; stigma orbiculari-depressum.

SOUTHERN NIGERIA. Oban District, 1911-1912, *Talbot*.

This species belongs to the group with very short stems. Its

most striking characteristics are the long spur with a short narrowly conical apex, the lamina of the lip being very small, the short column, the short and slightly downward-projecting rostellum and the pollinia. In external characters the species closely resembles *M. caespitosa* (Rolfe) Summerh., which, however, has a long slender column from near the base of which the upwardly directed long rostellum-lobes arise. With this is associated a long pollinia-stipes, which is sharply geniculate in the middle and provided with an elongated elliptical-lanceolate viscidium.

An examination of a number of species of the genus *Microcoelia* suggests the necessity of dividing it into several genera, the variation in the column and associated sexual organs being very great from one species to another. However, this can only be done satisfactorily by the comparison of a much greater number of species than I have been able to examine so far.

**Tridactyle Wakefieldii** Summerhayes, comb. nov. *Angraecum Wakefieldii* Rolfe in Dyer, Fl. Trop. Afr. 7, 146 (1897), partim ; descriptio ampliata.

Herba epiphytica, scandens, ultra 1 m. alta, caule longo gracili 1.5-3 mm. diametro radices numerosas flexuosas ramosas tenues emittente. *Folia* 1-2.5 cm. distantia ; laminae patentes vel leviter reflexae, oblongo-lanceolatae, lanceolatae vel ovato-lanceolatae, apice breviter, aequaliter vel paulo inaequaliter, acute bilobulatae, 1.5-3 cm. longae, 5-13 mm. latae : vaginae arctae, longitudinaliter pluricostatae, internodiis paulo breviores. *Inflorescentiae* racemosae, patentes, graciles, 4-6 cm. longae, laxae 4-6-florae, basi vaginis duabus membranaceis imbricantibus truncatis instructae ; bracteae praesertim inferiores vaginiformes, membranaceae, obtusae vel truncatae, usque ad 5 mm. longae. *Flores*  $\pm$  erecti, albi, ovario cum pedicello 1-2 cm. longo. *Sepalum* intermedium oblongo-ellipticum, obtusum vel apiculatum, 3 mm. longum, 1.7 mm. latum, quinquenervium ; sepala lateralibus oblique oblongo-lanceolata, subacuta, 4-4.5 mm. longa, 1.6 mm. lata, trinervia. *Petala* paulo oblique lanceolato-oblonga, obtusa vel subacuta, 3.5 mm. longa, 1.5 mm. lata. *Labellum* e parte basali concava  $\pm$  elliptica anguste trilobatum, totum 1 cm. longum, inter apices loborum lateralium 1 cm. latum ; lobus intermedius lanceolato-ligulatus, acutus, 3.5 mm. longus, 1.2 mm. latus ; lobi laterales patentes lanceolato-lineares, apice leviter recurvati, 4.5-5 mm. longi, basi 0.6 mm. lati ; calcar ex ore circiter 2 mm. diametro sensim angustatum, filiforme, 6-7 cm. longum. *Columna* brevis, circiter 1 mm. longa ; anthera hemisphaerica, antice anguste et acute rostrata, pollinii stipite unico apice spathulato basi angustissimo, viscidio magno suborbiculari antice cordato ; rostellum deflexo-productum, latum, truncatum, bifidum.

KENYA COLONY. Nyika Country, *Wakefield* (type) ; Mombasa, Nov. 1884, *Wakefield* (partly).

**ZANZIBAR.** No exact locality, May, Vaughan 2011 ; 2109.

Rolfe described his *Angraecum Wakefieldii* from two gatherings which are in the Kew Herbarium. One of these, labelled "Nyika Country, E. Trop. Africa. Rev. T. Wakefield. Comm. Col. Grant, Jan. 1876," consists of a sterile stem about 1 metre long bearing a few leaves, other detached ones being in a capsule. It is clear that the words "Stem long and climbing" in the description were drawn up from this specimen. The other sheet, labelled "From Rev. Thos. Wakefield, Mombasa, E. Trop. Africa: Nov. 1884," bears two fragments, one of which has two leaves and is obviously conspecific with the specimen on Sheet 1, although the leaves are a little broader. This specimen also bears a single sterile raceme which was clearly overlooked by Rolfe when he drew up his description. The other fragment consists of a short stem which, although in fruit, exactly matches the plant identified by Rolfe as *Angraecum aphyllum* Thouars (*Microcoelia aphylla* Summerhayes, comb. nov.) on p. 180 of the Flora of Tropical Africa. The last two lines of the description of *A. Wakefieldii*, dealing with the inflorescences and fruits, were evidently drawn up from this specimen. Two leaves from the other specimen on the sheet have been struck down in close proximity to this specimen of *M. aphylla* and were probably thought by Rolfe to belong to the specimen, although an examination shows without doubt that it is quite devoid of leaf-sheaths or any sign of a leaf and indeed has never borne any.

*Angraecum Wakefieldii* is therefore founded on a mixture, the vegetative characters being based on one species and the inflorescence and fruit on another, no flowers being present. However, from his comparison of the species with *A. clavatum* Rolfe (*Solenangis clavata* Schltr.), it is evident that Rolfe had in mind a leafy plant and only included the fragment of *M. aphylla* because he thought that the leaves mounted nearby belonged to it.

Quite recently Mr. & Mrs. J. H. Vaughan of Zanzibar have sent to Kew beautifully preserved flowering specimens of a climbing orchid. A comparison of these with the leafy specimens included in *Angraecum Wakefieldii* shows that they are undoubtedly conspecific. The single inflorescence-rhachis on Wakefield's Mombasa specimen agrees perfectly with the Zanzibar material. The structure of the flowers shows that the species is more correctly placed in *Tridactyle*, to which I have accordingly transferred it. I have also supplied an amended and complete description since the original one is so misleading.

*T. Wakefieldii* is very distinct in appearance from all other species of *Tridactyle* known to me and in general habit closely resembles the West African *Solenangis clavata* Schltr., *S. scandens* Schltr. and *Dinklageella liberica* Mansf. The extremely long spur and narrowly trilobed lip are distinguishing features, the latter being commonly found in *Tridactyle*.

**XXIII—SECOND LIST OF FUNGI AND DISEASES OF  
ECONOMIC PLANTS IN TANGANYIKA TERRITORY.**  
G. B. WALLACE.

This list comprises records of fungi and diseases of economic plants which have been made since the preliminary list was compiled (Kew Bulletin, 1932, 28), up to the end of the year 1935.

With few exceptions the identifications have been made or confirmed by the staff of the Imperial Mycological Institute, Kew. Other authorities who have assisted with identifications are mentioned by name.

So far as possible the nomenclature adopted is that recommended by the Plant Pathology Committee of the British Mycological Society in their "List of Common Names of British Plant Diseases" as revised in 1934.

***Acacia campylacantha* Hochst. ex A. Rich.**

In roots : *Ustilina zonata* Lév. Morogoro, 16.2.33. No. 1532.

***Agave sisalana* Perrine (Sisal).**

In stump : *Aspergillus niger* van Tiegh. Ruvu, 20.9.34. Culture 200 ; *Podospora* sp. Ruvu, Nov. 1931. Cultures 111-113. Probably the same as *Hypocopra austro-americana* (Speg.) Sacc. var. *Agavis americanae* Speg.

***Asparagus officinalis* L.**

On leaves and stems : *Puccinia Asparagi* DC. (Rust). Moshi, 14.11.35. No. 1572.

***Cajanus Cajan* (L.) Millsp. (*C. indicus* Spreng.). (Pigeon Pea).**

In seed : *Nematospora Coryli* Pegl. Shinyanga, July 1930. No. 1400.

***Canavalia ensiformis* DC. (Sword Bean).**

On leaves : *Cercospora* sp. not det. Moshi, 14.7.32. No. 1515. It does not appear to be *C. Canavaliae* Syd.

On collar and pods : *Sclerotium Rolfsii* Sacc. Kasulu, 25.4.32. No. 1472.

***Capsicum annuum* L. (Chilli Pepper).**

On collar : *Sclerotium Rolfsii* Sacc. Moshi, 15.7.32.

***Carica Papaya* L. (Papaw).**

Disease of leaves very like virus. Morogoro, 13.6.31. No. 1412.

***Ceiba pentandra* Gaertn. (Kapok).**

In roots : *Ustilina zonata* Lév. Usambara Mtns., Aug. 1935.

***Cineraria* sp.**

On leaves : *Aecidium* sp. Moshi District, 9.12.35. No. 1580.

**Citrus aurantifolia** (Christm.) Swingle (Lime).

On leaves : *Cephaleuros mycoidea* Karst. Morogoro, 15.5.31. No. 1410.

**C. Aurantium** L. (Orange).

In fruit : *Diplodia gossypina* Cooke, *Penicillium digitatum* Sacc., *Phytophthora palmivora* Butler, *Polyopeus* sp. Muhesa, 1933.

On leaves : *Sporotrichum Citri* Butler (Scab). Muhesa, Aug. 1935. No. 1563 ; Ring Blotch (physiological). Iringa Prov., Sept. 1934, No. 1554.

**Coffea arabica** L. (Coffee).

In beans : *Nematospora Gossypii* Ashby & Nowell, Moshi, Nov. 1931. No. 1457.

On cherries : *Botrytis* sp. (Warty disease). Usambara Mtns., 8.7.35. No. 1564.

Collar dry rot (associated with Mealy Bug, *Pseudococcus brevispinosus*, syn. *P. bromeliae*.—ident. A. H. Ritchie), Usambara Mtns., Feb. 1934. No. 1546.

On collar, leaves and cherries : *Fusarium lateritium* Nees var. *longum* Wr. (*Fusaria autographice delineata*, No. 964). Usambara Mtns., 1932, Coll. H. H. Storey. *F. Solani* var. *cumartii* (Carp.) Wr. Usambara Mtns., 1932, Coll. H. H. Storey. (cf. *Ann. Appl. Biol.* xix, 1932). Both det. Dr. Wollenweber.

**C. liberica** Bull. ex Hiern.

On leaves : *Cephaleuros mycoidea* Karst. Bukoba, July 1931. No. 1421.

**Cymbopogon citratus** Stapf (Lemon Grass).

On leaves : *Puccinia Cymbopogonis* Mass. (Rust). Moshi, 7.9.35. No. 1570.

**Dahlia** sp.

On leaves : *Entyloma Dahliae* Syd. (Leaf Spot). Lushoto, 17.8.32. No. 1513.

**Helianthus annuus** L. (Sunflower).

On leaves : *Erysiphe Cichoracearum* DC. (Mildew). Moshi, 21.7.32. No. 1509.

**Hibiscus esculentus** L. (Okra).

On old fruits : *Myrothecium roridum* Tode, Morogoro, 21.5.32. No. 1477.

**Hordeum vulgare** L. (Barley).

In ears : *Ustilago Hordei* (Pers.) Lagerh. (Covered Smut). Iringa Prov., June 1934. No. 1579.

On leaves : *Helminthosporium teres* Sacc. (Net Blotch). Usambara



Mtns., 17.8.32. No. 1512. Det. N. J. G. Smith. *Puccinia anomala* Rostrup (Brown Rust). Usambara Mtns., 12.7.35. No. 1576.

**Lens esculenta Moench** (Lentil).

On leaves : ?*Erysiphe Polygoni* DC. (Mildew). Morogoro, July 1935. No. 1575.

**Manihot utilisima Pohl.** (Cassava).

On leaves : *Mycosphaerella Manihotis* Ghesq. & Henrard non Sy (probably). Muhesa, 4.7.32. No. 1521.

On stems : *Botryodiplodia Manihotis* Syd. Tanga, 1.7.32. No. 1520.

**Nicotiana Tabacum L.** (Tobacco).

On leaves : *Cercospora Nicotianae* Ell. & Ev. (Frog-eye Spot). Tunduru, June 1931. No. 1423. Det. J. C. Hopkins ; Leaf Curl (virus). Morogoro, 15.9.31. No. 1433. Det. T. W. Kirkpatrick ; Blackfire (physiological). Iringa Prov., May 1935.

Systemic diseases : ?*Bacillus carotovorus* L. R. Jones (Hollow-Stalk). Iringa Prov., April 1935 ; *Bacterium Tabacum* Wolf & Foster (Wildfire). Songea, May 1934. No. 1540. Det. J. C. Hopkins.

**Oryza sativa L.,** (Rice).

On glumes : *Helminthosporium Oryzae* van Breda (Brown Spot). Pangani, 11.7.32. No. 1527. Det. N. J. G. Smith ; *Piricularia Oryzae* Cav. (Blast). Lindi, June 1934. No. 1544.

In grains of ear : *Ustilaginoidea virens* (Cke) Tak. (False Smut). Kilosa, 24.6.32. No. 1497.

**Pennisetum spicatum Koern.** (Bulrush Millet).

On leaves and ears : *Sclerospora graminicola* (Sacc.) Schroet. (Downy Mildew and Green-ear disease). Mwanza, February and March 1932. No. 1455 and 1471.

In ears : *Tolyposporium Penicillariae* Bref. (Smut). Tanga, 2.7.32. No. 1494.

**Persea Americana Mill.** (Avocado).

On leaves : *Cephaleuros mycoidea* Karst. Morogoro, May 1931. No. 1411.

Cankers on stem, branches, and twigs : Morogoro, Oct. 1934.

**Phaseolus lunatus L.** (Lima Bean).

On leaves : *Ascochyta Phaseolorum* Sacc. (Blotch). Iringa Prov., June 1935. No. 1558.

**P. mungo L.** (Gram).

On leaves : *Cercospora* sp. Kilosa, May 1932. No. 1480.

**Physalis peruviana** L. (Cape Gooseberry).

On leaves : *Entyloma Physalidis* (Kalchbr. & Cooke) Wint. Morogoro, 28.7.31. No. 1418. Det. E. M. Doidge.

**Pisum sativum** L. (Pea).

On leaves etc.: *Erysiphe Polygoni* DC. Lushoto, August 1932. No. 1533.

**Poinciana regia** Boj. (Flamboyante). = *Delonix regia* Raf.

In roots : *Ustulina zonata* Lév. Morogoro, March 1934.

**Prunus Amygdalus** Stokes (Almond).

In roots : *Bacterium tumefaciens* E. F. Sm. & Towns. (Crown Gall). Iringa Prov., June 1934. No. 1538.

**P. domestica** L. (Plum).

In roots : *B. tumefaciens* E. F. Sm. & Towns. (Crown Gall). Usambara Mtns., July 1935.

On leaves : *Puccinia Pruni-spinosae* Pers. (Rust). Usambara Mtns., July 1935. No. 1578.

**P. Persica** Stokes (Peach).

In roots : *B. tumefaciens* E. F. Sm. & Towns. (Crown Gall). Usambara Mtns., July 1935.

On leaves : *Taphrina deformans* (Berk.) Tul. (Leaf Curl). Iringa Prov., June 1934. No. 1537.

**Pyrus communis** L. (Pear).

In roots : *B. tumefaciens* E. F. Sm. & Towns. (Crown Gall). Usambara Mtns., July 1935.

**P. Malus** L. (Apple).

In roots : *B. tumefaciens* E. F. Sm. & Towns. (Crown Gall). Usambara Mtns., July 1935.

**Rosa** sp.

In roots : *B. tumefaciens* E. F. Sm. & Towns. (Crown Gall). Moshi, 1932.

**Saccharum officinarum** L. (Sugar Cane).

On leaves : *Leptosphaeria Sacchari* van Breda. Pangani, 11.7.32. No. 1519.

On leaves, sheaths and stems : *Pleocyta Sacchari* (Mass.) Petr. & Syd. Mkiyuni, 8 & 9 June, '32 ; Pangani, 11.7.32. Nos. 1489, 1500, 1518.

**Secale cereale** L. (Rye).

On leaves : *Puccinia secalina* Grove (Brown Rust). Usambara Mtns., 17.8.32. No. 1511.

**Sesamum orientale L.** (Sesame).

On leaves: *Cercospora Sesami* Zimm. Morogoro, 12.5.32. No. 1476; *Helminthosporium gigasporum* B. & Br. subsp. *javanicum* Penz. & Sacc. (provisionally). Morogoro, 1.6.32. No. 1481; *Oidium erysiphoides* Fr. (Mildew). Morogoro, 12.5.32. No. 1475; Leaf Curl (probably virus). Morogoro, 1.6.32. No. 1483.

**Solanum Lycopersicum L.** (Tomato).

Systemic disease: Mosaic (virus). Moshi Dist., May 1935. No. 1574.

**S. Melongena L.** (Egg Plant).

On leaves: *Accidium* sp. (Rust). Moshi Dist., 29.10.35. No. 1571.

**S. tuberosum L.** (Potato).

In tubers: "Spraing." Arusha, April 1932. No. 1468. Det. G. H. Pethybridge.

**Sorghum vulgare Pers.** (Guinea Corn).

On leaves: *Sclerospora Sorghi* (Kulk.) Weston & Uppal (Downy Mildew). Mwanza, February 1932. No. 1456.

On leaves of young plants: *Ascochyta sorghina* Sacc. Morogoro, 5.3.32. No. 1458.

In grains: *Sphacelia Sorghi* McRae ("Asali disease") and *Cerebella Sorghi-vulgaris* Subram. near Kilosa, 21.6.32. No. 1490; *Tolyposporium Ehrenbergii* (Kühn) Pat. (Smut). Shinyanga, May 1933. No. 1535.

**Tephrosia Vogelii Hook. f.**

In seeds: *Nematospora Coryli* Pegl. Morogoro, 28.7.30. No. 1401.

**Thea sinensis L.** (Tea).

On leaves: *Cephaleuros mycoidea* Karst. Tukuyu, 21.10.32. No. 1462.

On twigs: *Stilbella Theae* Bernard. Tukuyu, December 1931. No. 1441.

**Theobroma Cacao L.** (Cacao).

On dead branches and pods: *Nectria Jungneri* P. Henn. Usambara Mtns., 24.9.32. No. 1508; *Botryodiplodia Theobromae* Pat. Usambara Mtns., 7.7.32. No. 1499.

In pods: *Phytophthora* sp. Usambara Mtns., 7.7.32.

In roots: *Ustilina zonata* Lév. Usambara Mtns., August 1935.

On old stumps: *Kretzschmaria cetrarioides* (Welw. & Curr.) Sacc. Usambara Mtns., 7.7.32. No. 1496.

**Triticum vulgare Vill.** (Wheat).

On glumes : *Bacterium translucens* var. *undulosum* Smith; Jones, & Reddy (Black Chaff). Iringa Prov., August 1935. No. 1577. Det. J. McDonald.

On leaves : *Epicoccum purpurascens* Ehrh. Iringa Prov., August 1935. No. 1568 ; *Puccinia triticina* Erikss. (Brown Rust). Iringa Prov., July 1931. No. 1419.

On leaves and glumes : *Septoria nodorum* Berk. (Glume Blotch). Iringa Prov., June 1934. No. 1543.

### **Verbena sp.**

On leaves : *Erysiphe Cichoracearum* DC. (Mildew). Lushoto, 17.8.32. No. 1510.

### **Vitis vinifera L. (Grape Vine).**

On leaves : *Uncinula necator* (Schw.) Burr. (Mildew). Uluguru Mtns., 10.12.32. No. 1528.

On leaves and fruit : *Plasmopara viticola* (Berk & Curt.) Berl. & de Toni (Downy Mildew). Ruvu, 29.3.34. No. 1536.

### **Voandzela subterranea Thou. (Bambarra Groundnut).**

On roots and fruit : *Sclerotium Rolfsii* Sacc. Morogoro, 16.6.32. No. 1488.

On leaves : *Erysiphe Polygoni* DC. (Mildew). Bukoba, 18.4.32. No. 1473.

### **Zea Mays L. (Maize).**

In ears and tassels : *Sorosporium Reilianum* (Kühn.) McAlp. (Head Smut). Uluguru Mtns., above 5000 ft., 29.3.32. Nos. 1460 & 1461.

In ears and on old stalks : *Gibberella Saubinetii* (Mont.) Sacc. Morogoro, 18.1.32. No. 1444 ; *Fusarium moniliforme* Sheld. (*Gibberella moniliformis* (Sheld.) Winel.). Morogoro, January 1932. Cultures Nos. 61 & 106 ; *Diplodia Frumenti* Ell. & Ev. Mkiyuni, 9.6.32. Nos. 1486-7 ; *D. macrospora* Earle. Morogoro, 23.1.32. No. 1447 ; *D. Zeae* Lévl. Morogoro, 23.1.32. No. 1449.

On old stems : *Clasterosporium Lindavianum* Reichert, Moshi, 15.7.32. No. 1507 ; *Leptosphaeria eustoma* (Fr.) Sacc. forma *Zeae* Berl. Morogoro, 20.1.32. No. 1446 ; *L. orthogramma* Sacc. Moshi, 15.7.32. No. 1501. ; *Nigrospora sphaerica* (Sacc.) Mason. Morogoro, 31.8.31. No. 1429 ; *Papularia sphaerosperma* (Pers.) von Höhn. (group) Moshi, 15.7.32. No. 1504. ; *Papularia vinosa* (Berk. & Curt.) Mason. Morogoro, 23.1.32. No. 1450 ; *Phaeocystostroma ambigua* (Mont.) Petr. Morogoro, 23.1.32. No. 1448.

## **ENTOMOGENOUS FUNGI**

*Entomophthora Aphidis* Hoffm. Parasitic on *Aphis leguminosae* on *Arachis hypogaea*. Coll. H. H. Storey, 1932.

*Tetracium coccicolum* von Höhn. (the conidial stage of *Podonectria*

*coccicola* (Ell. & Ev.) Petch. Parasitic on scale insects on leaves and twigs of *Citrus* sp. Muhesa, 4.7.32.

*Sphaerostilbe aurantiicola* (B. & Br.) Petch, Muhesa, 4.7.32. No. 1522. Parasitic on scale insects on leaves and twigs of *Citrus* sp. The conidial stage (*Microcera aurantiicola* Petch) was present, but scanty.

#### ARMILLARIA

Living host-plants of *Armillaria* sp. in Tanganyika Territory, in addition to coffee and tea recorded in Preliminary List, are as follows: [*A. mellea* (Vahl.) Quél. was identified from dead stumps of forest trees.]

*Acacia Cunninghamii* Hook. *A. dealbata* Link (Silver Wattle). *A. decurrens* Willd. (Black Wattle). *Acacia* sp. (Indig.). *Acrocarpus fraxinifolius* Wight & Arn. *Albizia moluccana* Miq. *Cajanus* *Cajana* Millsp. (Pigeon Pea). *Calodendron* sp. *Cedrela odorata* L. *C. Toona* Roxb. ex Rottl. *Chlorophora excelsa* Benth. & Hook. f. ("Mvule"). *Citrus Aurantium* L. (Orange). *C. Limonum* Risso (Lemon). *Crotalaria* sp. *Cupressus lusitanica* Carr. *Cyphomandra betacea* Sendt (Tree Tomato). *Eucalyptus citriodora* Hook. *E. globulus* Labill. *Erythrina lithosperma* Blume. *Grevillea robusta* A. Cunn. *Hibiscus Rosa-sinensis* L. *Jacaranda* sp. *Manihot utilissima* Pohl (Cassava). *Musa sapientum* L. (Banana). *Rosa* sp. *Saccharum officinarum* L. (Sugar Cane). *Sesbania* sp. *Trema guineensis* Priem. *Widdringtonia Whytei* Rendle (Mlanje Cedar).

#### XXIV—MISCELLANEOUS NOTES.

DR. TEMPANY.—Dr. H. A. Tempany, C.B.E., Director of Agriculture in the Straits Settlements, has been appointed Assistant Agricultural Adviser to the Secretary of State for the Colonies.

**Cultivated Crop Plants\*.**—The aim and scope of this work is briefly indicated in the foreword, as follows:—

"This is the first attempt that has been made to furnish information showing the distribution of Tropical and Sub-tropical crop plants in the British Empire, and its compilation has been undertaken in the belief that it will prove of value, especially to the officers of the several Departments of Agriculture concerned. It is hoped

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\*"Cultivated Crop Plants of the British Empire and of the Anglo-Egyptian Sudan (Tropical and Sub-tropical); Based on information which has been supplied by the Departments of Agriculture concerned". By H. C. Sampson, C.I.E., B.Sc., F.L.S., Economic Botanist, Royal Botanic Gardens, Kew; Indian Agricultural Service, Retd. Royal Botanic Gardens, Kew, Bulletin of Miscellaneous Information, Additional Series XII. London. H. M. Stationery Office, 1936. Pp. viii + 251. Price 6s. 6d.

that it may stimulate the trial of new crops, and more especially the trial of other varieties of crops already under cultivation.

With this latter object in view, a series of notes has been compiled which, it is expected, will be of use to those engaged in studying and comparing the varieties of crop plants. Space has of necessity limited the number of crops which can be so dealt with, and those selected are, in the main, the staple foods of the Tropics and Sub-tropics on which the indigenous peoples of the British Empire are dependent for their livelihood and existence ”.

An inventory of this type was asked for by the Conference of Colonial Directors of Agriculture in 1931. The information on which it is based was received in reply to a questionnaire sent from Kew to the relevant government departments in all Tropical and Sub-tropical countries of the British Empire and in the Anglo-Egyptian Sudan. Under each species are given the native country (where known), local names, and a classified list of countries in which the species is or has been grown, indicating its status in each country, (*e.g.* successfully introduced : still under trial : etc). Full information on the distribution of all important Tropical crops is thus made available. A list of commonly-used synonyms appears as an appendix.

**The Extra Pharmacopoeia.\***—The second volume of the twentieth edition of this well-known work has now appeared. After the death of Dr. Martindale in 1933, the Pharmaceutical Society purchased all rights in “ The Extra Pharmacopoeia ” and the editor of the “ British Pharmaceutical Codex (1934) ” was appointed editor of it. This arrangement should enable progressive revision of the two books to be carried out and maintain their complementary character. Furthermore, it is fitting that the work should have been adopted by a body with no direct commercial interests, and with medical, pharmaceutical, chemical and other experts available.

The work has been issued in two volumes since the 15th edition in 1912, volume 1 containing matter dealing with treatment by drugs and chemicals, and volume 2 with information on analysis, bacteriology, diagnosis, sterilisation, etc.—subjects ancillary to therapeutics. The present edition of volume 2 is based on the same general principles as other recent editions. Certain minor changes, however, have been made. These include the addition of a good deal of new information that has appeared as a result of recent research.

A number of vegetable drugs are referred to under the section “ Analytical Addenda to Materia Medica in Vol. 1,” which occupies over 200 pages of the book. The information that appears there naturally varies with the nature of the drug-plant in question and what has already been given in regard to it in complementary works.

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\* “ The Extra Pharmacopoeia of Martindale and Westcott.” Twentieth Edition. Volume II. The Pharmaceutical Press, 23 Bloomsbury Square, London, W.C.1. 1935. Pp. xxxiv + 889. Price 22s. 6d. net.

In this section inconsistency has arisen in the use of authorities with botanical names. They are quoted in some instances but not in all. The volume is attractively printed and bound and contains an astonishing amount of information for its small size.

F. N. HOWES.

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**Apples and Pears.\***—This book of 213 pages is the official report of the Conference on Apples and Pears organised by the Royal Horticultural Society and held at the Crystal Palace from the 19th to 21st September, 1934.

The book commences with a list of the Conference Committee, followed by the opening address given by Lord Aberconway, C.B.E., President of the Society.

Among the ten papers read during the three days of the conference, all of which are printed in full, mention might be made of the following :—

“The Basis of Classification of Apples and Pears,” by Mr. E. A. Bunyard, Chairman of the Conference Committee. “The fruit Trials at Wisley,” by Sir Daniel Hall. “New Varieties of Apples and Pears,” by Mr. A. N. Rawes. “The Fruit the Public Wants,” by Mr. H. L. Taylor. “Stocks for Pears,” by Mr. R. G. Hatton. An excellent paper, prepared for but not read at the conference, on “Pollination of Apples, Pears and Plums” is also published.

In conjunction with the conference, an endeavour was made to collect together as many varieties as possible of apples now grown in this country. A list of the varieties shown, approximately 1,000 in number, with notes is printed on pp. 185-203. A comprehensive collection of cider apples was also exhibited, details of which are given.

The book, which is illustrated with plates and figures, will be found a most useful compilation by all who are interested in apples and pears whether grown commercially or for domestic consumption.

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**Colloids in Agriculture.†**—It is desirable that those interested in the applications of science to agriculture should be familiar with the nature and chemical behaviour of colloids, which play so large a part in the structure of the soil, in the metabolism of living organisms, and in other more specialised departments such as the chemistry of milk, insecticides, etc. The author of the present volume expresses the hope that it will be of use to county organizers, district lecturers and rural instructors, and to agricultural students. It is divided into three parts. In the first the nature and behaviour

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\* “Apples and Pears: Varieties and Cultivation in 1934.” The Report of the Conference on Apples and Pears held by the Royal Horticultural Society, September, 1934. The Royal Horticultural Society Vincent Square, London, S.W.1. Pp. iv+213. Price 7s. 6d.

† By C. E. Marshall, M.Sc., Ph. D. Edward Arnold & Co., London, 1935. Pp. vi + 184. 5/- net.

of colloidal substances are outlined ; part 2 is devoted to colloids in the soil, and in part 3 colloids which are components of living organisms are discussed.

Those who are not well-versed in physical and organic chemistry usually find the subject of colloids somewhat abstruse, as is amusingly stated in the preface. The author has attempted to overcome this difficulty by writing in as simple language as possible, and by illustrating his points by reference to subjects with which agriculturists are familiar in everyday life. This has been well done, but even so, from its very nature, much of the subject matter will be far from easy reading for the majority of agriculturists, and the book will probably be found most useful by fairly advanced students.

C. R. METCALFE.

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**Botanical Magazine.**—The first part of vol. 159 was published on February 29th and contains the following plant portraits :—*Arisaema Pradhanii* C. E. C. Fischer (t.9425), a remarkable aroid found at Jalook, Sikkim, allied to *A. Griffithii* Schott with a spathe almost like burnished metal ; *Hymenanthera crassifolia* Hook. f. (t.9426), the remarkable shrubby New Zealand "violet" distinguished for its snowy white or purple-tinged glistening berries ; *Synthyris stellata* Pennell (t. 9427), a native of the north-western United States ; *Dendrobium hercoglossum* Reichb. f. (t.9428), from Siam ; *Decumaria sinensis* Oliver (t.9429), the Chinese representative of this interesting genus, the only other species, *D. barbara* L., being native in the south-eastern United States ; *Rhododendron longesquamatum* Schneider (t.9430), from Szechwan, China ; *Lotus aegaeus* (Griseb.) Boiss. (t.9431), a native of the Balkan Peninsula ; *Glaucidium palmatum* Sieb. & Zucc. (t.9432), a monotypic genus of *Podophyllaceae* endemic in Japan, nearly allied to the monotypic *Hydrastis canadensis* L. (see Bot. Mag. tt. 3019, 3232) of the north-eastern United States ; *Lachenalia mutabilis* Sweet (t.9433) from South Africa, introduced to this country over 100 years ago ; *Cupressus lusitanica* Mill. (t.9434), a native of the high mountains of Mexico and Guatemala ; and *Delphinium Consolida* L. subsp. *paniculatum* (Host) Turrill (t. 9435), a dainty larkspur from south-eastern and southern Central Europe and Asia Minor, with a much involved synonymy, the name here given being a new combination.

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**Everyday and Intermediate Botany.\***—These two textbooks together cover the syllabuses of examinations of School and Higher School Certificate standard. This does not imply, however, that what may be called the "exam. outlook" is encouraged by the author. On the contrary, in his preface to the later book he writes :

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\* "Everyday Botany" by L. J. F. Brimble. Macmillan & Co. Ltd., London, 1934. Pp. vii + 589. Figs. 340. Price 7s. 6d. "Intermediate Botany," by L. J. F. Brimble. Macmillan & Co. Ltd., London, 1934. Pp. vii + 562. Figs. 337. Price 8s. 6d.



"While, however, the requirements of these examinations have been borne constantly in mind during the preparation of the book, an endeavour has been made to present botany as a coherent and developing study of high value in scientific training and also of importance in its contacts with everyday life." In other words, since examinations exist, they cannot be ignored, but their requirements should not be catered for to the exclusion of the broader cultural approach to the subject.

These precepts the author has embodied in the two volumes under review. In "Everyday Botany," especially, the economic aspect of the subject is stressed in such a way that those beginning the study of botany will appreciate from the outset its relationship with human needs and activities. Both volumes are profusely illustrated by photographs, drawings and diagrams, many of which were prepared by the author.

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**Insect pests of Glasshouse Crops.\***—This comprehensive work on insect pests of glasshouses is written in a simple and concise manner, and will certainly prove of great value to both private and commercial growers. The book is divided into nine chapters and is excellently illustrated by 21 plates and 15 text figures. Chapter I is devoted to the effects of glasshouse conditions on the occurrence and control of pests. The following seven chapters deal with soil pests, caterpillars, aphides, white-fly, thrips, eelworms, woodlice and miscellaneous pests. The life cycles of many species are briefly described, and the various plants on which they prey, the methods of control and prevention, are given in full. The final chapter is devoted to the methods of controlling the pests in glasshouses. Such methods as soil sterilization by heat, the chemical treatment of soil, the fumigation of glasshouses, humidity in relation to fumigation, and various insecticides are described.

The appendix consists of a valuable alphabetical list of glasshouse plants, with associated pests, and characteristic injury.

With the exception of two or three small errors in the spelling of plant names (*Irisine* for *Iresine*, and *Chorozima* for *Chorizema*) the book is very free from misprints.

Dr. H. W. and Mrs. Miles, and Mr. H. C. Long, who is both editor and publisher, are to be congratulated on the production of a much-needed handbook to this important aspect of horticulture.

L. STENNING.

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\* By H. W. Miles and M. Miles. With a Foreword by J. C. F. Fryer. Edited and Published by H. C. Long. 1935. Pp. 174. Price 8s. 6d. (by post 9s.).

# BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1936 ROYAL BOTANIC GARDENS, KEW

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## XXV—MUNDULEA FISH POISON.

P. J. GREENWAY (Botanist, E.A.A.R.S., Amani, Tanganyika Territory).

Attention has recently been drawn by Worsley (1) to the insecticidal possibilities of *Mundulea sericea* (Willd.) Greenway, comb. nov. (*M. suberosa* (DC.) Benth.). The following is an account of its botany, ecology, distribution and recorded uses as a poison.

### BOTANY.

The genus *Mundulea* was founded by Benthams (2 & 3), and it contains about 20 species (4) the majority of which are recorded from Madagascar. It was at one time included under *Tephrosia* and is a connecting link between that genus and *Millettia*.

Thonner (5) in his key description states that the seeds of some species are used as a fish poison but the only references of this nature I have been able to trace refer to *Mundulea sericea* (Willd.) Greenway, and not to any other species.

*Mundulea sericea* has been recorded from the Western Peninsula of India, Ceylon, Madagascar, Tropical Africa, and as far south as Natal and the Transvaal in South Africa. In Ceylon its distribution varies from rare to abundant, and it has been suggested that it may have been originally introduced into its few Ceylon localities (6, 7, 8, 9, & 10).

***Mundulea sericea* (Willd.) Greenway, comb. nov.** *Cytisus sericeus* Willd. Sp. Pl. 3. 1121 (1803). *Tephrosia sericea* DC. Prodr. 2, 249 (1825). *T. suberosa* DC. Prodr. 2, 249 (1825); Wight & Arn. Prodr. Fl. Ind. Or. 1, 210 (1834); Hook. Icones Pl. 2, t. 120 (1837); Wight, Ill. Ind. Bot. 1, 198, t. 79 (1840); Harv. in Harv. & Sond. Fl. Cap. 2, 204 (1862). *Robinia suberosa* Roxb. Hort. Beng. 56 (1814), nomen; Fl. Ind., ed. Carey, 3, 327 (1832). *R. sennoides* Roxb. Fl. Ind., ed. Carey, 3, 328 (1832). *Dalbergia stricta* Bojer, Hort. Maur. 111 (1837), nomen. *Mundulea suberosa* Benth. Pl. Jungh. 248 (1852); Bak. in Oliv. Fl. Trop. Afr. 2, 126 (1871), and in Hook. f. Fl. Brit. Ind. 2, 110 (1876); Bak. f. Leg. Trop. Afr. 216 (1929). *Tephrosia ichthyneca* Bertol. Misc. Bot. 18, 18. t. 3 (1858). *T. Petersiana* Klotzsch in Peters, Reise Mossamb. t. 9 (1861). *Mundulea striata* Baill. in Bull. Soc. Linn. Par. 1, 389 (1883).

An erect virgately branched *shrub* or a *small slender tree* up to

25 ft. tall, with smooth greenish yellow-brown bark or very rough longitudinally fissured very corky yellowish brown bark. Young branchlets densely pilose-velvety. *Leaves* alternate, numerous, imparipinnate; rhachis 3-17 cm. long, slightly to densely silky-pubescent; stipules small, linear; leaflets 9 to 19, the lower ones often alternate, shortly stalked, 1.5-7.3 cm. long, 0.8-2.4 cm. broad, narrowly ovate-lanceolate, obtuse, apiculate, more or less glabrous and bright green above, nearly glabrous to densely silky and silvery beneath. *Inflorescence* a rather dense terminal raceme. *Flowers* large on pilose pedicels 1-1.5 cm. long; calyx silky, deeply campanulate, segments short, broadly triangular, acute, the upper two connate; petals mauve or lilac, occasionally white, up to 2.5 cm. long; standard silky, broadly oval or obovate, with a long claw; wing-petals falcate, oblong, coherent with the keel near the base; keel obtuse, the apex incurved; upper stamen free and geniculate at the base, united upwards with the rest in a closed tube, filaments flattened upwards, anthers uniform; ovary multiovulate; style incurved, subterete, glabrous, the apex inflexed; stigma capitate. *Fruit* a pod 7.5-9.5 cm. long, 0.5-1 cm. broad, linear, flat, densely velvety with short golden brown hairs, sutures rather thick, subindehiscent; seeds 2-10, about 4 mm. broad, yellowish brown.

#### GEOGRAPHICAL RANGE AND HABITAT IN AFRICA.

*Mundulea sericea* is a shrub or small tree of light bushwoods and park steppes on dry slopes (4). It has been recorded from the Sudan to West Tropical Africa, Angola and S.W. Africa; and from Kenya southwards to Natal and the Transvaal. In Tanganyika Territory the Germans recorded it from the Usambaras, Bagamoyo, Usaramo, near Dar es Salaam, Uhehe and Bukoba (4).

Specimens of the plant are represented in the Amani Herbarium from the E. Usambaras, Kerenge, *Omari bin Chambo*. Umba Steppe, Mwakikonge, *Bally*. Kondoa-Irangi District, *Burt* 1026. Bukoba District, Nyaskozi, Karagwe, *Haarer* 2440. Mpwapwa District, near Tubugwe, *Hornby* 394. Iringa District, Iringa-Tukuyu Road, *Staples* 229. Cult. Amani, *Braun* 637, *Grote*. Kenya Colony, Samburu, *Graham* 1780. Zanzibar, *Mrs. Taylor* 70. Prison Island, *Wilson* H. 32/35.

In a recent attempt to discover more about its habitat and mode of occurrence a journey was undertaken along the western foot of the E. Usambaras as far north as Bwiti on the eastern side of the north end of the range on the borders of the Umba Steppe, an area in which it was reported to occur by some local natives.

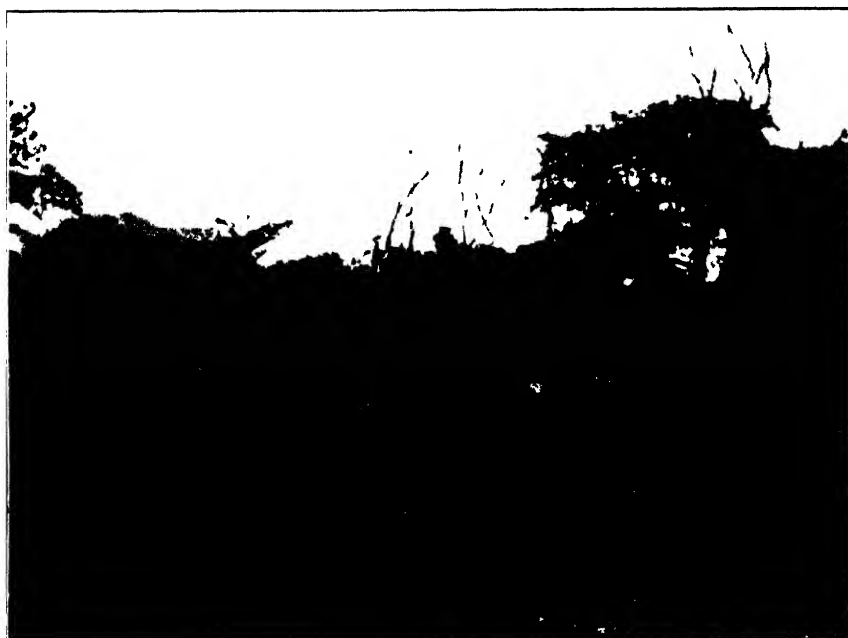
It was found growing in open deciduous bush and open to closed evergreen bush formations at about 100 to 1500 ft. altitude. It formed small societies of fairly compact to rather scattered stands and was occasionally found singly on pale reddish brown to very dark red soils.



PLATE VII



1. *Mundulea sericea* in deciduous bush formation subject to fire showing habit and great development of coppice growth - N. end of F. Usambaras



The deciduous bush formation varied from very open to more or less closed stands or even closed island-like stands in an open formation. It was chiefly composed of *Combretum* (tree and scandent species), *Dombeya*, *Lannea*, *Commiphora*, *Acacia*, *Lonchocarpus Bussei* Harms, *Stereospermum Kunthianum* Cham., *Grewia*, *Tamarindus indica* L. and *Terminalia spinosa* Engl. The most important grasses of the formation were *Chloris myriostachya* Hochst., *Panicum* sp., *Panicum maximum* Jacq. (in burnt areas) and *Themeda triandra* Forssk. together with *Cyperus compactus* Lam. The "island" stands were composed of a very dense block of vegetation of *Tamarindus indica* L., *Commiphora*, *Combretum* (scandent species) and *Entada phaseoloides* (L.) Merr. with an outer guard of *Sansevieria* surrounded by *Panicum* sp. and *Cyperus compactus* Lam.

In a secondary bush association a *Mundulea sericea* society was found growing with *Panicum maximum* Jacq., *Combretum* (bush species), *Markhamia obtusifolia* Sprague, *Dombeya*, *Indigofera*, *Solanum* and an occasional *Acacia*.

The formation is subject to periodical grass fires which control the habit of the *Mundulea*. The plant naturally develops a solitary stem which may attain a height of 25 ft. ; but repeated grass fires kill the aerial parts and a great abundance of coppice growth develops at the base of the old stems. This may reach a height of 10 ft. to be again killed by fire ; a stand is often seen of dead and blackened sticks with numerous young green coppice shoots up to 6 ft. tall growing from the bases of the old stems (Figs. 1 & 2).

The evergreen bush formation usually occurred on very bright red soils and in the majority of examples seen was always a closed formation. Its chief constituents were *Brachylaena Hutchinsii* Hutch., *Cynometra* sp., *Mimusops sulcata* Engl., *Euphorbia* spp. (*E. nyikae* Pax types frequent, dwarf succulent types and *E. Tirucalli* L. common, as well as candelabra types occasional), *Croton dichogamus* Pax, *Combretum* sp. (an evergreen liane), scandent shrubs of *Annonaceae*, scattered *Encephalartos Hildebrandtii* A. Br. & Bouché, tree and herbaceous *Aloë* spp., several species of *Sansevieria*, and a number of species of xerophytic epiphytic orchids. The scandent and beautiful white-flowered *Vanilla Roscheri* Rchb. f. hung its fleshy greenish brown stems like snakes over the bushes.

*Mundulea sericea* in this evergreen formation was of a different habit. It usually produced a solitary stem up to 25 ft. tall with a very lightly branched more or less flat crown occupying the second stratum in the 30 ft. and sometimes 40 ft. tall canopy. Its bark was greenish yellow and smooth, with almost imperceptible longitudinal fissures, strikingly different from the very corky bark produced by the plant in the Deciduous Bush Formation subject to fire.

I have examined thoroughly material from both formations. In each there is great variation in size and general outline of the

leaflets, but to my mind no satisfactory botanical distinctions can be made between the rough-bark and the smooth-bark types.

It is probable that the general habitat of the plant in India, Ceylon and Tropical Africa is a deciduous bush or scrub formation subject to grass and bush fires and that the corky bark is produced as an individual protection against fire. Where the plant is found in evergreen bush formations no corky bark is produced.

*Mundulea sericea* has also been recorded in *Brachystegia* woodland on sandy granitic soils (*Staples*, Iringa District) and as forming a local colony (*Hornby*, E. Mpwapwa). I have seen it in an evergreen bush formation east of Moa in the Umba Steppe and at Moa itself.

In Usambara *Mundulea* is nowhere frequent. It has everywhere to be searched for, but I have found it between 1000 and 1500 ft. as follows :—

- (a) In deciduous bush formation at Bombo, Maji Moto, Kwamticha, north end of E. Usambaras in the Umba Steppe, and south west of Daluni.
- (b) In a secondary bush association at Mashewa.
- (c) In evergreen bush formation at Kwemukumba near Kijango and near Hemagoma on the Korogwe-Mashewa road.

Reports of its occurrence have been received from near Gomba between the Mkomazi and Pangani Rivers and from the Same district in the Middle Pares.

#### POISONOUS PROPERTIES.

Apparently the plant is well known to the natives of the Western Peninsula of India, Ceylon, Madagascar, and Tropical Africa as far south as Mozambique, as an extremely efficient fish poison.

The earliest published record of this use that I have been able to trace is that quoted by Greshoff (11) under the name *Tephrosia ichthyneca* Bertol., who quotes from D.A. Rosenthal, "Synopsis Plantarum Diaphoricarum" p. 1025 (1862). Greshoff further quotes: "Die Wurzel dieser auf Mozambique wachsenden Pflanze wird, vermuthlich aus Afrika, nach London als Fischgift importiert. Dragendorff vermochte das leicht zersetzliche wirksame Princip, das weder ein Glycosid noch ein Alkaloid zu sein scheint, nicht zu isoliren (Pharm. Zeit. 1881, p. 313.—Jahresb. für Pharm. 1881, 207) "

Other published African records appear to be few. It is not mentioned by Engler in 1895 (12); I have already referred to Thonner in 1915 (5); Harms in 1915 (4) simply states that the fruits are used as a fish poison. Irvine in 1930 (13) says: "This shrub is sometimes specially planted in towns as well as *Tephrosia Vogelii*, both shrubs being used as fish poisons".

The earliest Indian record\* appears to be one in 1886 (14),\* under the name *Mundulea suberosa*. "The seeds are used for poisoning fish".

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\*J. Graham (Cat. Pl. Bombay, 47: 1839), under *Tephrosia suberosa* says: "The seeds are used to poison fish."—Editor.

Further records from India are by Greshoff (11) who quotes an extract from *Pharmacographia Indica*, 1: 417 for the year 1889, "The seeds are used in Southern and Western India as a fish poison. They stupefy the fish which are then readily taken by the hand. The bark . . . . . has the same effect upon fish as the seeds". Watt in 1891 (15) quotes the Indian name *Surti* and states that the seeds are used as a fish poison.

Collectors' field records on specimens preserved in herbaria in reference to its use as a fish poison are few.

In E. Africa *Mundulea sericea* is well known as *mkwaia* (Kiswahili) *kikoko* (Kishambala), *mundu* (Kinyaturu) and *mukati* (Kinyaturu). The Kiswahili "blanket" name *mtupa* or *utupa* for fish poisons in general is limited to *Mundulea* by the addition of *ya pori*.

All accounts that I have obtained from East African natives agree that the pounded bark is used to poison fish and not the seeds as reported in India. It may be mentioned in passing that most of the seed pods I have seen are infested with a boring insect and contain very few viable seeds.

Some native informants state that the corky bark is not as poisonous as the smooth, and accounts of its toxic action vary. They all agree that *Mundulea* is more poisonous than *Tephrosia Vogelii*. Some state that it will even kill crocodiles up to about 4 ft. long; others deny this but affirm that *Mundulea* has the effect of driving all crocodiles away from the river. In this connexion I was informed by an European Game Warden that all the crocodiles had been cleared from the Umba River by the Wakamba who employed a very effective poison, but I have not yet been able to connect this definitely with *Mundulea*.

I have been informed on good authority that cattle-owning peoples on the Pangani River tie strips of the bark round the legs of their cattle whenever they are taken to the river to water to protect them from crocodiles. This seems unnecessary if crocodiles can be driven away by merely throwing the pounded bark into the river.

Most natives are agreed that fish caught by the use of *Mundulea* bark are eaten with considerable risk of poisoning and that a number of such cases were known to them.

One native informant told me that the bark was also employed for homicidal purposes.

The method of collection adopted is to cut the stems at ground level and strip off the bark as far as the branchlets. If the sap is flowing freely the bark comes away quite easily and can be stripped off with the fingers; if not in active growing condition it has to be shaved off with a knife. The cutting of the stems at ground level does not kill the plant as it coppices freely.



With the assistance of the agricultural department of Tanganyika Territory we have arranged for the monthly collection of about one kilo of bark from certain areas at the western and northern foot of the E. Usambaras. The bulk of available material is not large and it is hoped that these areas will stand the monthly collection of bark for a year as it takes anything from one to seven bushes or small trees to obtain a kilo of fresh bark. In view of the commercial possibilities it may be stated that propagation from seed does not present any difficulties.

The chemistry of *Mundulea* is still imperfectly known and the monthly sampling of bark will enable Dr. Worsley, the Biochemist at Amani, to make systematic investigations. It has been reported that the bark and root contain a very toxic unnamed glucoside (11) but the preliminary work at Amani has not confirmed this. Dr. Worsley has, however, isolated rotenone from the bark and shown that there is great variation in both this and the insecticidal properties of the bark obtained from different localities, and that both vary in series of subsequent samples from the same locality.

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## XXVI—THE BAMBOO GENERA, *DINOCHLOA* AND *MELOCALAMUS*. F. A. McCLURE.

A careful study of authentic specimens of *Pseudostachyum compactiflorum* Kurz (the type of the monotypic genus, *Melocalamus* Benthams) reveals the fact that this species is not generically distinct from *Dinochloa* Büse.\* This rather surprising statement may be supported by the following summaries of the points of similarity and difference between the type species of the two genera.

### GENERIC CHARACTERS IN COMMON.

1. Rhizome of a modified sympodial type (McClure, 1925)†.
2. Culms terete, zigzag (the nodes geniculate), more or less scandent, thick-walled, solid or fistulose, often with semi-dissociated strands of conducting tissue in the central canal.
3. Culm-sheaths glabrous, thickish, firm, with a peculiar expansible zone of variable width at the base, the auricles and oral setae prominently developed, the sheath-blade reflexed, finely striate, glabrous, or nearly so, except near the base on the upper surface.
4. Branches in abruptly spreading tufts, slender, terete, short, subequal, with one strong, central one, which sometimes does not develop beyond the bud stage.
5. Leaf-blades glabrous throughout, the venation obscurely pseudotessellate.
6. Inflorescences spicate, consisting of dense clusters of minute pseudospikelets at the nodes of slender branches with short internodes.
7. Spikelets 1-flowered, terminal on dwarf branches of the rachis (axes of pseudospikelets).
8. Glumes (empty) usually 2, obtuse, ventricose, glabrous, similar to the lemma, but smaller, and preceded by one or more, still more minute, gemmiferous bracts, and by a tiny prophyllum.
9. Lemma rotund, or ovoid, ventricose, more or less distinctly keeled, glabrous.
10. Palea oblong, ventricose, not keeled, or only very obscurely so near the base.
11. Stamens 6, not exserted, the filaments very short, free, the anthers usually more or less apiculate.
12. Ovary narrow, glabrous, the style very short, the stigmas 3 or 2, relatively short and thick.
13. Fruit a dry berry or nut, with a thick, tough pericarp, globular, with three scales (the upper glume, the lemma, and palea) persistent at the base.

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\* The type of Büse's genus is at the Rijksherbarium in Leiden, where I examined it by the kind permission of Dr. Lam, the Director, and Dr. Henrard, the Conservator of the Herbarium. A detailed redescription of the type species of this genus, with an account of the synonymy and of some of the circumstances surrounding its valid specific name is under preparation.

† For references see end of paper.

## THE TWO SPECIES CONTRASTED.

*Dinochloa*  
*scandens* (Bl.) O.Ktze.

*Pseudostachyum*  
*compactiflorum* Kurz.

- |   |  |   |
|---|--|---|
| 1. The expan-<br>sible zone at<br>the base of<br>the culm-<br>sheath. | More prominent.  | Less prominent.   |
| 2. Flowering<br>branches  | Glabrous, producing<br>short, secondary and<br>tertiary branches.  | Retorse - pubescent;<br>primary branches only,<br>secondary ones very<br>rarely, the tertiary not<br>at all developed, in<br>specimens seen.  |
| 3. Glumes.  | Scarcely keeled.   | Distinctly keeled.  |
| 4. Lemma.   | Distinctly smaller than<br>the palea, more<br>or less noticeably com-<br>pressed, the central<br>nerve not prominent.  | Equal to, or slightly<br>larger than, the palea,<br>the central nerve prom-<br>inent.   |
| 5. Palea.   | Glabrous, papery to<br>firm in texture, the<br>nerves very obscure,<br>sometimes with the re-<br>motest suggestion of a<br>2-keeled condition at<br>the very base; the<br>margins membranace-<br>ous, much convolute,<br>not visibly ciliate at<br>the apex. | Glabrous or nearly so,<br>very thin, membranace-<br>ous, two more or less<br>visibly keel-like nerves<br>in the lower part at<br>the back; the margins<br>not convolute, prom-<br>inently ciliate at the<br>apex. |
| 6. Lodicules.   | None or only rudimen-<br>tary.   | Three, conspicuous.   |
| 7. Anther - tips<br>(extension of<br>connectives).                    | Long, prominent, scab-<br>rous to penicillate.   | Short, inconspicuous,<br>glabrous.  |
| 8. Fruit.   | At maturity rarely ex-<br>ceeding 1 cm. in dia-<br>meter.  | Up to 3 cm. in diameter   |

When compared in number and importance, with the *differences* between the two species, the *resemblances* are seen to be greater by far, and quite ample to justify their inclusion in the same genus. We have, therefore, to make the following new combination : ***Dinochloa compactiflora* (Kurz) McClure**, comb. nov.

*Pseudostachyum compactiflorum* Kurz, in Journ. As. Soc. Bengal, **42**, 252 (1873) ; Indian For. **1**, 361. pl.2, fig. 13 (1876) ; For. Flor. Brit. Burma, **2**, 567 (1877).

*Melocalamus compactiflorus* Benth. in Journ. Linn. Soc., Bot. **19**, 134 (1881) (without generic descr.) ; in Benth. et Hook. f. Gen. Pl. **3**, 1212 (1883) (with generic descr.).

Bentham cited no specimens. However, there are, in the Herbarium of the Royal Botanic Gardens, Kew, several sheets of flowering and fruiting specimens of this bamboo, which were collected by Kurz in the type locality (Martaban, British Burma), identified by him, and labelled, in his handwriting, *Pseudostachyum compactiflorum* Kurz. From these authentically named specimens we may form a clear idea of the branching habit, and of the character of the inflorescences and fruits, as well as the culm-sheaths, which are so often lacking in flowering specimens of bamboos. By means of these latter, which are very characteristic, we may associate with the leafless, flowering specimens, sterile specimens which afford fully developed foliage.

In order to forestall any misunderstanding which might grow out of the fact that my statements, in tabular form above, appear to be irreconcilable, in certain respects, with the original descriptions of the species in question, I will remind the reader that in my terminology and in my interpretation of bamboo morphology, particularly that of the inflorescence, I differ on many points from those who have prepared descriptions of bamboo genera and species in the traditional manner. †

The basic structure of the inflorescence in *Dinochloa*, as in *Schizostachyum*, is one which I have termed the *pseudospikelet*, because it has so often been mistaken for a *spikelet*. As I have already pointed out elsewhere (McClure, 1934), the pseudospikelets have as their axes dwarf branches of the rachis. These are clothed at the base with one or more gemmiferous bracts, preceded by a prophyllum and followed by glumes (where these are present) and then the florets. The buds in the axils of the bracts are potential pseudospikelets. Among the numerous dire results of the misinterpretation of these structures I may point out several which may be responsible for obscuring the real taxonomic position of *Melocalamus* for so many years.

The buds in the axils of the bracts at the base of the pseudospikelets have been mistaken for rudimentary florets, and their

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† My observations of the minute details were made by means of a binocular microscope, using 10x eyepieces with .7x and 2x objectives.

prophylls, naturally, for paleas. As a result, the "spikelets" (the pseudospikelets in my sense) have been spoken of as several-flowered when, in reality, the *true* spikelets are one-flowered. Furthermore, the significance, for taxonomic purposes, of the prophylls, the gemmiferous bracts, the true (empty) glumes, as well as the lemmas, has not been utilized to its best advantage, since these structures have been confused, both in terminology and interpretation.

To document these statements, I need only to refer to the original descriptions of the two species and the two genera under discussion in this paper (Schultes, 1830 ; Büse, 1854, pp. 387-388 ; Kurz 1873 and 1877 ; Bentham, 1881 and 1883) and to the interpretation of *Dinochloa* Büse in Munro's description (Munro ; 1868, p. 153) and the illustration of the "spikelets" (really pseudospikelets) (ibid., figs. 2 and 3 of plate 5) and of the "two-keeled paleas" (really prophylls of the buds in the axes of the bracts of the pseudospikelets) (ibid., figs. 4 and 5, plate 5).

In closing I wish to acknowledge my great indebtedness to the Director, and to the Keeper of the Herbarium, of the Royal Botanic Gardens, Kew, for the privilege of making extensive studies of the Oriental bamboo types at Kew, and for many courtesies conferred upon me by their staff in this connection. I owe special thanks to Mr. C. E. Hubbard for numerous kindnesses he bestowed upon me during my sojourn at Kew.\*

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\* Acknowledgment is also made of my indebtedness to the Rockefeller Foundation, of New York, for financial aid making possible the purchase of literature and equipment essential to the continued pursuit of these studies. And finally, it is a pleasure to acknowledge my deep obligation to the late Dr. A. S. Hitchcock and to Mrs. Agnes Chase, Agrostologists of the U. S. National Herbarium, for the facilities, the advice and the encouragement that they lent me constantly during my sojourn in Washington.

## XXVII—ERANTHEMUM OF THE "FLORA OF TROPICAL AFRICA." E. MILNE-REDHEAD.

C. B. Clarke, when writing the account of the *Acanthaceae* for the "Flora of Tropical Africa," appears to have overlooked the conclusions at which Radlkofer had arrived several years previously. Radlkofer\* had pointed out that the genus *Eranthemum* as defined by Linnaeus, was synonymous with *Daedalacanthus* T. Anders., a member of the tribe *Ruellieae*, and that most of the species hitherto placed in *Eranthemum* must be transferred to a new genus which he called *Pseuderanthemum*, and which belonged to the tribe *Justicieae*†. C. B. Clarke, however, retains in the genus *Eranthemum* ten species which, in the opinions both of Radlkofer and of Lindau, should have been placed in the genus *Pseuderanthemum* Radlk., *Eranthemum* L. not being known from the African continent, unless one considers it to be synonymous with *Lankesteria* Lindl., a view not held by the writer.

Thus the genus *Pseuderanthemum* Radlk. was created to include the species which T. Anderson had erroneously placed in *Eranthemum*. In his definition of this genus Anderson states "antheris bilocularibus, loculis plus minus divaricatis muticis." Whilst several of the species enumerated by Clarke in the "Flora of Tropical Africa" agree with Anderson's description of *Eranthemum* in having ditheous anthers and can be retained in *Pseuderanthemum*, others have anthers which are monotheous, and must accordingly be placed in *Ruspolia* Lindau, a hitherto monotypic genus created for a plant collected by Dr. Riva in southern Abyssinia. *Pseuderanthemum* and *Ruspolia* are undoubtedly very closely allied, but it is convenient to treat them as distinct genera and in doing so the writer is following both Clarke and Lindau.

It is remarkable that the presence of monotheous anthers in certain species of "*Eranthemum*" had not attracted the attention of workers on the African *Acanthaceae*. As early as 1827, Schumacher and Thonning‡ in an excellent description of *Justicia hypocrateriformis* Vahl, mentioned that the anthers are unilocular, and in the figures both of *Eranthemum hypocrateriformis* and *Pseuderanthemum seticalyx* in the "Botanical Magazine" (tt. 6181, 8244), the anthers are shown quite correctly as being monotheous, but in neither case are they so described in the text. On the other hand, a curious error is the drawing by Clarke of a ditheous anther on a sheet of *Eranthemum hypocrateriformis* in the Kew Herbarium.

Whilst *Pseuderanthemum* is widely distributed in the tropics of both the Old and the New World, *Ruspolia* appears to be confined to the African continent. Both *Pseuderanthemum* and *Ruspolia* are

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\* Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. 13, 282 (1883).

† see Stapf. in Bot. Mag. 135, sub.t. 8239 (1909).

‡ Beskr. Guin. Pl. 12 (1827).

widely spread in tropical Africa, but do not occur in Africa outside the tropics, although one species of *Ruspolia* reaches the northern Transvaal. In Africa it appears that *Pseuderanthemum* is usually associated with moist and shady habitats, several of the species being plants of the closed forest, whilst others, which grow in areas of lower rainfall, are constantly found in the evergreen fringing-forests along rivers. On the other hand *Ruspolia* does not occur in the closed forest, and frequently grows in dry and rocky country.

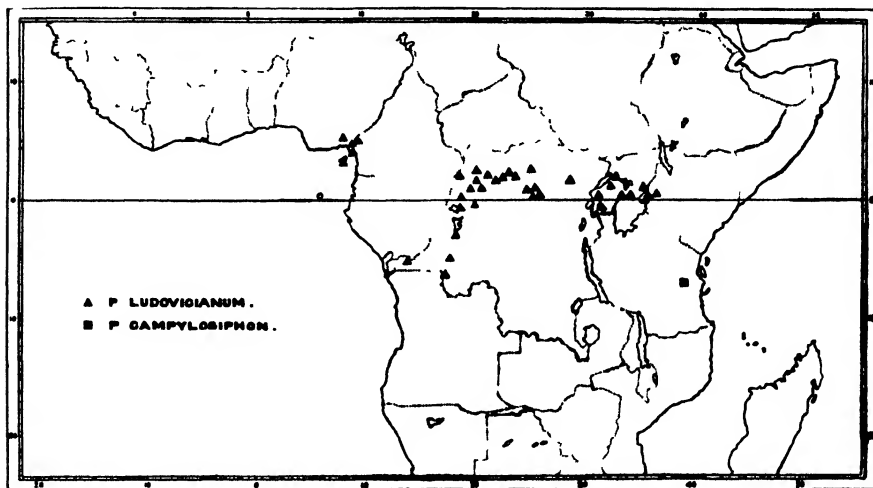


Fig. 1 Distribution of *Pseuderanthemum Ludovicianum* and *P. campylosiphon*.

Associated with this difference in the habitat requirements of *Pseuderanthemum* and *Ruspolia* is the colour of the flowers. The species of *Pseuderanthemum* inhabiting the closed forest have flowers which are whitish, flecked or flushed with lilac or mauve. Only two species have flowers which are bright red, *P. dispersum* and *P. Hildebrandtii*. Whilst little is known as to the habitat of the former species, the latter is a plant of fringing forests and evergreen thickets in East Africa, and, though flourishing in these moist and shady conditions, it appears able to survive lighter and drier periods, during the rainless seasons. In *Ruspolia*, plants of open sunny habitats, the flowers are all bright shades of red.

The form of the seeds of *Pseuderanthemum* and *Ruspolia* not only affords reliable specific characters, but also confirms the separation of *Ruspolia* as a genus distinct from *Pseuderanthemum*. In general the seeds of *Pseuderanthemum* are without any definite horny rim, and are rough on both faces, although the degree of roughness is usually greater on the inner surface. Those of *Ruspolia* are considerably larger, having a definite horny margin, are always smooth on their outer surface, and may or may not have a bold pattern on their inner surface. There is one exception to this rule, *P. Hilde-*

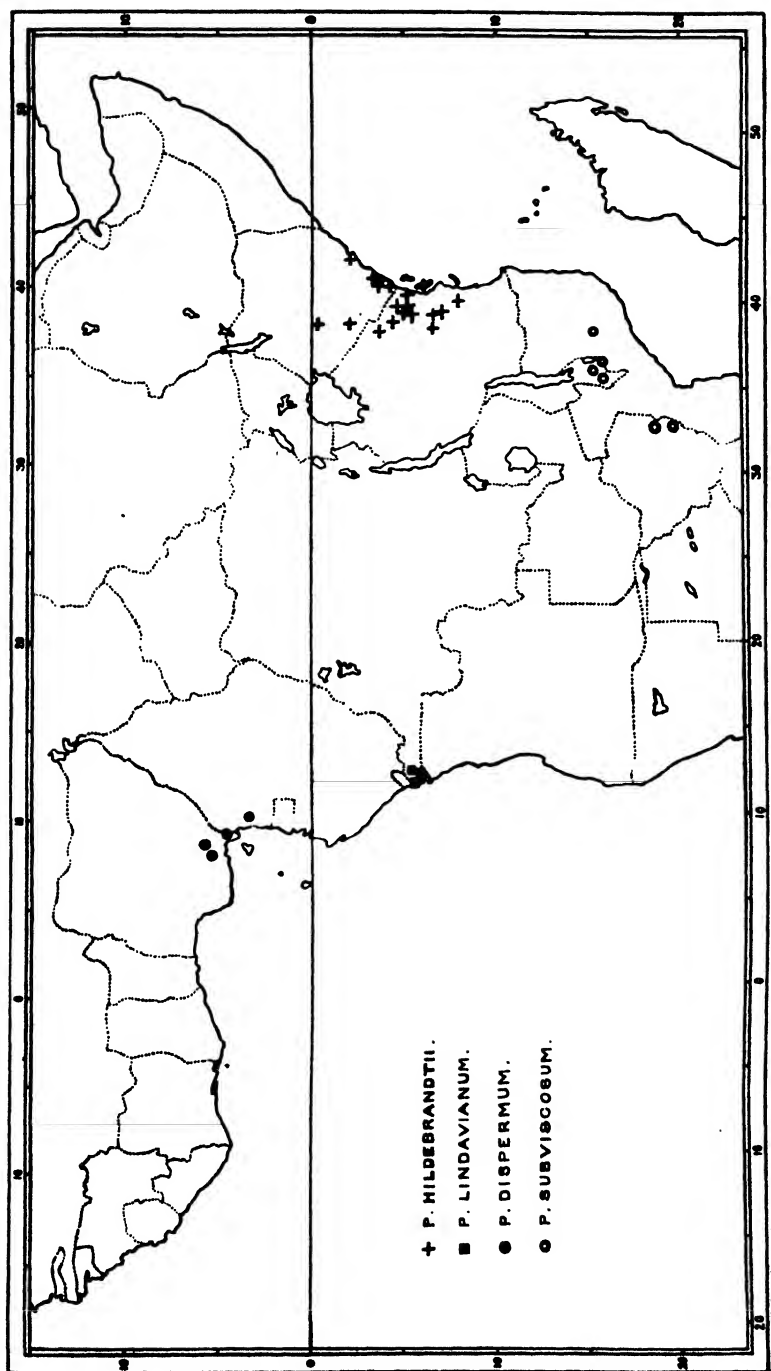


Fig. 2. Distribution of *Pseuderanthemum hildebrandtii*, *P. lindavianum*, *P. dispersum* and *P. subviscosum*.



*brandtii*, whose seeds are often smooth on their outer surface, and whose markings form a much more definite pattern than is the case in the seeds of the other African *Pseuderanthema*. The seeds of the recently described *P. campylosiphon* Mildbr. are as yet unknown, and unripe seeds of *P. subviscosum* appear similar to those of *P. Ludovicianum*. As the character of the seeds is extensively used in the accompanying keys, a series of illustrations has been prepared showing the seeds of the majority of the species. It should be pointed out that the seeds of *P. tunicatum* are in reality more similar to those of *P. Ludovicianum* than is suggested by the illustration. The seed of *P. Ludovicianum* which is figured, is unfortunately not completely mature, and immature seeds of *P. tunicatum* show a similar patterned roughness which becomes obscure as the seed ripens.

The distribution of the species of both genera is similar in that certain species are widely spread and others are extremely local. In the accompanying maps, which illustrate this fact in a striking manner, occurrences are plotted as accurately as possible whenever the locality is sufficiently indicated. Much field and taxonomic work yet requires to be done before it is possible to prepare maps of Tropical African species which will show in detail their complete distributions. Our knowledge of the flora is, however, sufficiently advanced for a start to be made to study the distribution of species within the continent, and to produce a classification of the various types of distribution which occur. It is unnecessary to emphasize the unsatisfactory distinction made between Eastern and Western species, which has in the past led to the creation of many new species, which now so often merely serve to swell the ever-growing lists of synonymy.

Of the ten species of *Eranthemum* enumerated by Clarke in the "Flora of Tropical Africa," four are now transferred to *Ruspolia*, one of them being reduced. The remaining six species are placed in *Pseuderanthemum*, two of them being reduced to synonymy. *P. Lindavianum* De Wild. and Th. Dur. which in the addenda to the Flora is wrongly reduced to *Rhinacanthus nasutus* (L.) Kurz (*R. communis* Nees), is now retained as a distinct species. Of the two species described since the publication of the "Flora of Tropical Africa," *Eranthemum bilabiale* C.B.Cl. is treated as synonymous with *Pseuderanthemum Ludovicianum* (Büttner) Lindau, and *P. campylosiphon* Mildbr. is retained as a distinct species. One new species of *Pseuderanthemum* and one new variety of *Ruspolia* are described in this paper.

The writer wishes to express his gratitude to the Keeper of Botany at the British Museum (Natural History) for allowing him to examine material in the herbarium. He also wishes to thank the Director of the Botanic Garden at Berlin, the Director of the Botanic Garden at Brussels, and Mr. P. J. Greenway of the East African

Research Station, Amani, for kindly lending specimens for examination. For the preparation of the illustrations accompanying this, paper, the writer is indebted to his wife and to Miss S. Ross-Craig.

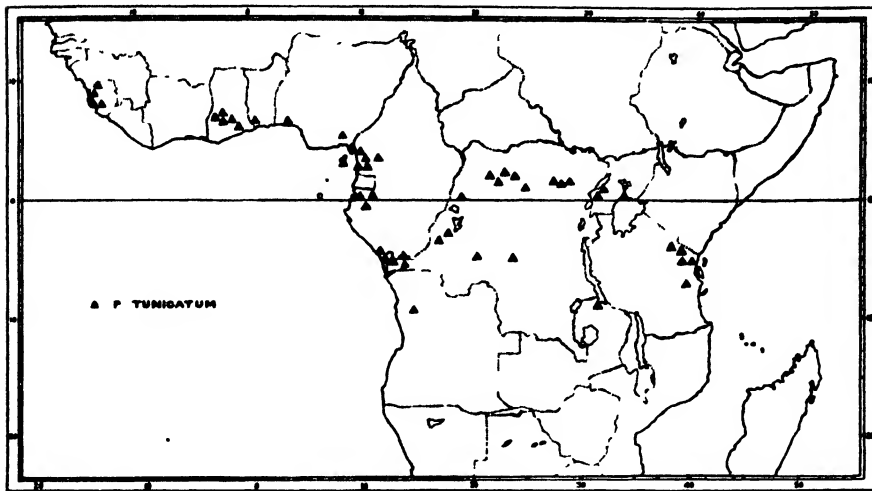


Fig. 3. Distribution of *Pseuderanthemum tunicatum*.

**KEY TO THE AFRICAN SPECIES OF PSEUDERANTHEMUM RADLK.**

Corolla-tube less than 1 cm. long, strongly curved ; flowers white ; capsule and seeds unknown.....1. *campylosiphon*

Corolla-tube more than 1 cm. long, or if less than 1 cm. long, not strongly curved.

Capsule normally 4-seeded.

Flowers light salmon-pink to brick red ; seeds smooth on outer, strongly reticulate on inner surface.....2. *Hildebrandtii*

Flowers white, flushed or spotted with pink, mauve or blue, never uniformly bright red ; seeds rough on both surfaces, not strongly reticulate on inner surface.

Capsule pubescent and glandular outside ; corolla-tube strongly inflated above ; stamens included ; flowers dull pink with darker centre ; seeds minutely rugose and pubescent.....3. *Lindavianum*

Capsule glabrous outside.

Corolla distinctly bilabiate ; stamens exserted.

Corolla-tube somewhat inflated above ; capsule less than 3 cm. long ; nodes of inflorescence few-flowered ..... 4. *subviscosum*

Corolla-tube scarcely inflated above ; capsule often more than 3 cm. long ; nodes of the inflorescence many-flowered..... 5. *Ludovicianum*

Corolla not distinctly bilabiate ; stamens included ; inflorescence rather slender with few flowers at each node ; corolla somewhat inflated above ; capsule less than 3 cm. long..... 6. *tunicatum*

Capsule normally 2-seeded, slightly pubescent outside ; flowers brick red to scarlet, with a darker centre ; inflorescence finely glandular ; seeds finely muricate, especially on the inner face..... 7. *dispermum*

# ENUMERATION OF THE AFRICAN SPECIES OF PSEUDERANTHEMUM RADLK.

1. **P. campylosiphon** *Mildbr.* in Notizbl. Bot. Gart. Berl. **11**, 1084 (1934).

TANGANYIKA TERRITORY. Morogoro District, in secondary forest, Uluguru Mts., 1500 m., *Schlieben* 2810 (type) ; Morogoro District, 1350 m., *Wallace* 143, 460 ; without locality, 1500 m., *Kirk* s.n.

This very distinct species had remained obscure until last year (1934) when Mildbraed described it from flowering material collected by Schlieben. About the same time specimens, also in flower, were received at Kew from Wallace. These were identified with an unnamed specimen sent to Kew by Sir John Kirk in 1882. *P. campylosiphon* is easily distinguished from all other African *Pseuderanthema* by its small flowers with short curved corolla-tube. Its fruits are not yet known.

2. **P. Hildebrandtii** *Lindau* in Engl. Bot. Jahrb. **20**, 39 (1894) ; Engl. Pflanzenw. Ost-Afr. C. 371 (1895) ; Lindau in Engl. and Prantl, Pflanzenfam. **4**, 3B. 330 (1895). *Eranthemum Hildebrandtii* C.B.Cl. in Dyer, Fl. Trop. Afr. **5**, 172 (1899).

KENYA COLONY. Kibwezi, 1000 m., *Scheffler* 81, *Kaessner* 701, *Dummer* 5070 ; Tana River at Emberre near Embu, 660 m., *M. D. Graham* in *Kenya Agric. Herb.* 1706 ; Tana River, 480 m., *Battiscombe* in *Kenya For. Herb.* 254 ; Mida, R. *N. Graham* in *Kenya For. Herb.* 1965 ; Lamu to Witu, *Whyte* s.n. ; the Coast, without locality, *Gardner* in *Kenya For. Herb.* 1451 ; Nyika Country near Mombasa, *Wakefield* s.n. ; Rabai Hills, Mombasa, *Taylor* s.n. ; Mwachi Creek, Mombasa, *Priestley & Scott* s.n. ; Shimoni, *Whyte*, s.n.

TANGANYIKA TERRITORY. Rau Forest, Moshi, 780 m., *Haarer* 725 ; Rau and Kahe Forests, 1050 m., *Lewis* 80 ; Mwembe, Pare, 900-1350 m., *Greenway* 2055 ; Duga, Usambara, *Holst* 3159 ; Maschana, Usambara, *Holst* 8800 ; Longuza, E. Usambara, *Zimmermann* in *Herb. Amani* 6315 ; Mombo, *Braun* in *Herb. Amani* 1788 ; Tanga, *Holst* 2110 ; Magila, near Tanga, *Kirk* s.n. ; Zindeni Hills near Handeni, 600 m., *Burt* 4858 ; Mt. Msassa, *Volkens* 64 ; Kilosa, 490 m., *Burt* 126, *Swynnerton* 745 ; Morogoro, 600 m., *Schlieben* 3317 ; Kimbosa and Morogoro, 200-360 m., *Bruce* 1042 ; Rufigi, 15 m., *Musk* 34.

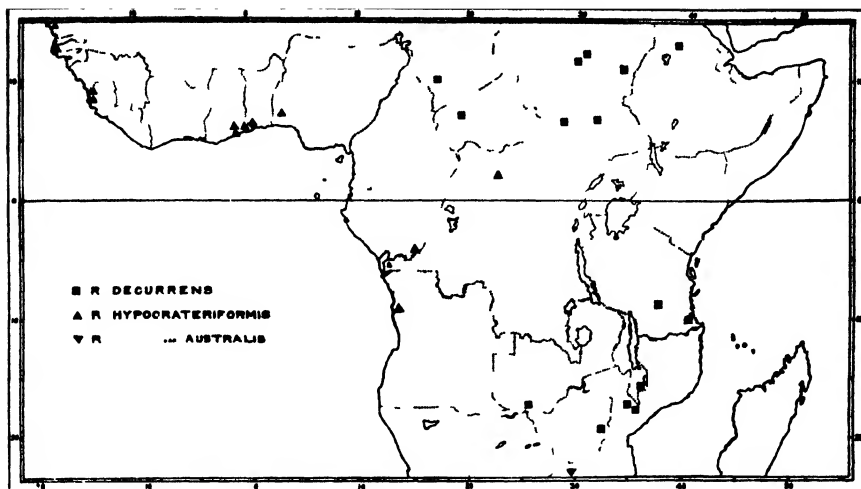


Fig 4 Distribution of *Ruspolia decurrens*, *R. hypocraeteriformis* and *R. hypocraeteriformis* var. *australis*

**ZANZIBAR PROTECTORATE.** Zanzibar, *Kirk* s.n., *Hildebrandt* 981 (type); *Last* s.n., *Toms* 90; *Taylor* 160, 538; *J. H. Vaughan* 1077.

A very distinct species, always recognizable at once by its seeds. Under dry conditions it is densely branched and has short internodes and small leaves, whilst under favourable conditions it develops a lax habit with large leaves. The flowers are various shades of light red.

**3. *P. Lindavianum* De Wild. & Th. Dur.** in *Compt.-rend. Soc. Bot. Belg.* 38, 104 (1900); *C. B. Clarke* in *Dyer, Fl. Trop. Afr.* 5, 514 (1900); *De Wild. & Th. Dur. Contr. Fl. Cong.* 2, 49 (1900) et *Reliq. Dewèvre.* 180 (1901); *Th. & Hel. Dur. Syll. Fl. Cong.* 428 (1909); *De Wild. Étud. Fl. Bas- et Moyen-Cong.* 3, 272 (1910). *Rhinacanthus communis* *C. B. Cl.* in *Dyer, Fl. Trop. Afr.* 5, 514 (1900), p. p. non *Nees*.

**BELGIAN CONGO.** *Chimbete. Dewèvre* 317 (type); *Bas-Congo*, without locality, *Cabra-Michel* 21; *Banana, Verschueren* 441; *Moanda, Gillet* 3234, *Vanderyst* s.n.; *Kizu, Wellens* 277; *Luki, Brixhy* s.n.

Plants of this species were found to be in cultivation at Kew under the name *Eranthemum nigritianum* *T. Anders.*, a species from which it is easily separable on account of its pubescent capsule and its seeds. The history of the cultivated plants could not at first be traced, and the species was, at the time, unrepresented in the Kew Herbarium. Light has since been thrown on the matter by the discovery in the Herbarium store of an unmounted specimen taken from a plant which was growing in the Gardens in 1917 that had been raised from a seed sent by *Mr. Gossweiler* in 1915, probably from the



Fig. 5. *Pseuderanthemum Lindavianum*. De Wild. & Th. Dur. 1, part of inflorescence, nat. size; 2, part of a lower leaf,  $\times \frac{3}{4}$ ; 3, calyx,  $\times 4$ ; 4, corolla, in section,  $\times 2$ ; 5, stamen & staminode, front view,  $\times 8$ ; 6, stamen, side view,  $\times 8$ ; 7, pollen grain,  $\times 300$  (approx.); 8, ovary & disc,  $\times 12$ ; 9, stigma,  $\times 16$ ; 10, part of infructescence, nat. size; 11, capsule valves,  $\times 2$ ; 12, seed,  $\times 6$ .

Portuguese Congo. The accompanying plate (fig. 5) was prepared from the living material and corresponding specimens are now preserved in the Herbarium. Like *P. dispersum*, *P. Lindavianum* appears to have a very restricted distribution, being known only from a small area around the mouth of the River Congo.

**4. *P. subviscosum* (C. B. Cl.) Stapf** in Bot. Mag. **135**, sub. t. 8244 (1909); Lindau in Wiss. Ergebn. Deutsch. Zentral-Afr.-Exped. 1907-8, **2**, 301 (1911). *Eranthemum subviscosum* C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 173 (1899); S. Moore in Journ. Linn. Soc. Bot. **40**, 161 (1911); Eyles in Trans. Roy. Soc. S. Afr. **5**, 483 (1916).

PORTUGUESE EAST AFRICA. Makua, Namuli Hills, *Last* s.n. (type)

NYASALAND. R. Shire, Shibisa [Chikwawa]—Tshinmuze, 600–1200 m., *Kirk* s.n.; Mt. Chiradzulu, 60–300 m., *Meller* s.n.; Mt. Milanji, 1200 m., *McClounie* 60, *Shinn* s.n.; without locality *Buchanan* 118, 449, 558.

SOUTHERN RHODESIA. Umtali, 1500–1800 m., *Steedman* in *Herb. Eyles* 5146; Melsetter District, Chirinda Forest, 1100–1200 m., *Swynnerton* 130.

This species is very closely allied to *P. Ludovicianum* and *P. tunicatum*, and in some respects combines the characters of these two species. It is confined to the highlands of south-eastern tropical Africa. Ripe seeds of *P. subviscosum* are still unknown.

**5. *P. Ludovicianum* (Bütt.) Lindau** in Engl. & Prantl, Pflanzenfam. **4**, 3B. 330 (1895); Th. Dur. & Schinz, Etud. Fl. Cong. **220** (1896); De Wild. & Th. Dur. Ill. Fl. Cong. **63**, t. 32 (1899); Contr. Fl. Cong. **2**, 48 (1900); Pl. Thonn. **1**, 41 (1900); Lindau in Schlecht. Westafr. Kautschuk-Exped. 316 (1900); De Wild. Étud. Fl. Bas- et Moyen-Cong. **2**, 203 (1907); **3**, 273 (1910); Th. & Hel. Dur. Syll. Fl. Cong. 428 (1909); De Wild. Pl. Thonn. **2**, 385 (1911); Étud. Fl. Kat. **2**, 148 (1913); De Wild. in Bull. Jard. Bot. Brux. **7**, 81 (1920); Contr. Fl. Kat. 202 (1921); Pl. Beq. **4**, 30 (1926). *Eranthemum Ludovicianum* Bütt. in Verh. Bot. Ver. Brand. **32**, 41 (1890); C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 172 (1899); S. Moore in Cat. Pl. Talb. Nigeria, 140 (1913); Hutch. & Dalz. Fl. W. Trop. Afr. **2**, 262 (1930). *Eranthemum ardisioides* C. B. Cl. in Dyer Fl. Trop. Afr. **5**, 173 (1899). *Eranthemum bilabiale* C. B. Cl. in Bull. Misc. Inform. Kew, 1906. 252 (1906).

NIGERIA. Oban District, *Talbot* 379, 1390, 1398, 1423, 1437.

BRITISH CAMEROONS. Victoria, *Preuss* 598; Johann-Albrechtshöhe, *Staudt* 537; Muea, 800 m., *Schlechter* 12853; above Buea, *Dalziel* 8210; Buea 900 m., *Mailland* 196.

FERNANDO PO. *Mann* 1437.

CAMEROONS. Between Ngusi and Mafura, 400 m., *Schlechter* 12905.

BELGIAN CONGO. Yanga, *Jespersen* 12; without locality, *Jespersen* 159; R. Ganga near Kasongo, *Büttner* 460 (type); Kasongo, *Vanderyst* 17483, 17557; Kenge, *Huyghe* s.n.; Kutu, *De Giorgi* 1278; Lac Tumba, *Laurent* s.n.; Bikolo, *Goossens* 2317; Eala, *Schouteden* 184, *Laurent* 1121, *Pynaert* 856, 901, 1045, *Corbisier* 947; Boende, *Goossens* 2603; Waka, *Goossens* 2704; Monsole, Ruki Valley, *Goossens* 2717; Lulanga, s.n. 145; Basankusu, *Bruneel* s.n.; Bolombo, *Thonner* 97; Mobeka, *De Giorgi* 35; Budjala, *Goossens* 4300; Gerena, *Goossens* 4316; Libanza *Goossens* 4761; Karawa, *Goossens* 4775, 4776, 4805, 4825; between Karawa and Likimi, *Goossens* 6316; Likimi *De Giorgi* 88; Lisala *Goossens* 4138; Dondussane, *Reygaert* 32, *Morethan* 619; Yambata, *Vermoesen* 40, *De Giorgi* 1358, 1620; Bumba, *Linder* 1848; Mobwasa, *Lemaire* 270, 399, *Reygaert* 786, 826, 926, 947, 1185, 1257, 1261, 1341, *De Giorgi* 673, 845; Imese, *Laurent* s.n.; Barumbu, *Laurent*, 1027, *Bequaert* 1025; Basoko, *Dewèvre* 426; Bomane, *Laurent* 1435; Mogandjo, *Laurent* 1404, 1411; R. Lomani, *Descampes* s.n.; between Buta and Mbina, *Seret* 98; Nala, *Boone* 155; Stanleyville, *Ghesquiere* 20, *Duchesne* 15, *Claessens* 621; Penghe, *Bequaert* 2403, *Putnam* 54, 94; between the Lubile and the Lukaya, *Vandermeiren* s.n.; Grelco Section, *Quarré* 2592; indecipherable locality, *Vanderyst* 22107, 22164, 22189; Mossote, *Ledoux & Huyghe* 13; Djombo, *Collaer* 11; without locality, *Dewèvre* 782, 1147; Lolungu, *Vanderyst* 145.

UGANDA. Bwamba Forest, Toro, *Hazel* 174; Bwamba Pass, Ruwenzori, 1600 m., *G. Taylor* 3276; crater lake, Toro, *Tufnell* s.n.; Mpanga Forest, Toro, 1800 m., *G. Taylor* 3210; Budongo, Bunyoro, *Brasnett*, in *Uganda For. Herb.* 241; Bunyoro, *Evans* 742; Ngusi River, Lake Albert, 900 m., *Bagshawe* 1359; Ankole, *Fyffe* 62/15, 70/15; Namalala Forest, *Fyffe* 124; Semunye Forest, *Fyffe* 224; Bweya Forest, *Fyffe* 211; Bukasa, Sese Islands, *Thomas* 874; Mawokoto, *Brown* 209; Entebbe, *Mahon* s.n., *Fyffe* 198, *Mailland* 566, *E. & C. Godman* 33; Kitibulu Forest, *G. Taylor* 3378; Mukono, Kyagwe, 1200 m., *Hansford in Herb. Snowden* 1880; Mukono and Kirerena, Kyagwe, *Dummer* 248; Sezibwa Fall, *Jack in Coryndon Mus. Herb.* 5878; Buvuma Is., *Bagshawe* 632; Bumoni, Elgon, 1800 m., *Snowden* 864; without locality, *Scott-Elliot* 7521. (type of *Eranthemum ardisioides* C.B.Cl.7).

KENYA COLONY. North Kavirondo, 1500 m., *Jack* 149; Kakumega Forest, *Battiscombe in Kenya For. Herb.* 1210.

This species is confined to the evergreen forests, its distribution stretching from Nigeria through the Cameroons and the Congo to the Nyanza basin.

6. *P. tunicatum* (Afzel.) *Milne-Redhead*, comb. nov. *Justicia tunicata* Afzel. *Remed. Guin.* 3, 17 (1814); *Roem. and Schultes Syst.* 1, 581 (1817); *Spreng. Syst.* 1, 79 (1825); *A. Dietr. Sp. Pl.* 1, 378 (1831); *Nees in DC. Prodr.* 11, 428 (1847). *Eranthemum nigritianum* T. Anders. in *Journ. Linn. Soc. Bot.* 7, 51 (1863); S. Moore in *Journ.*

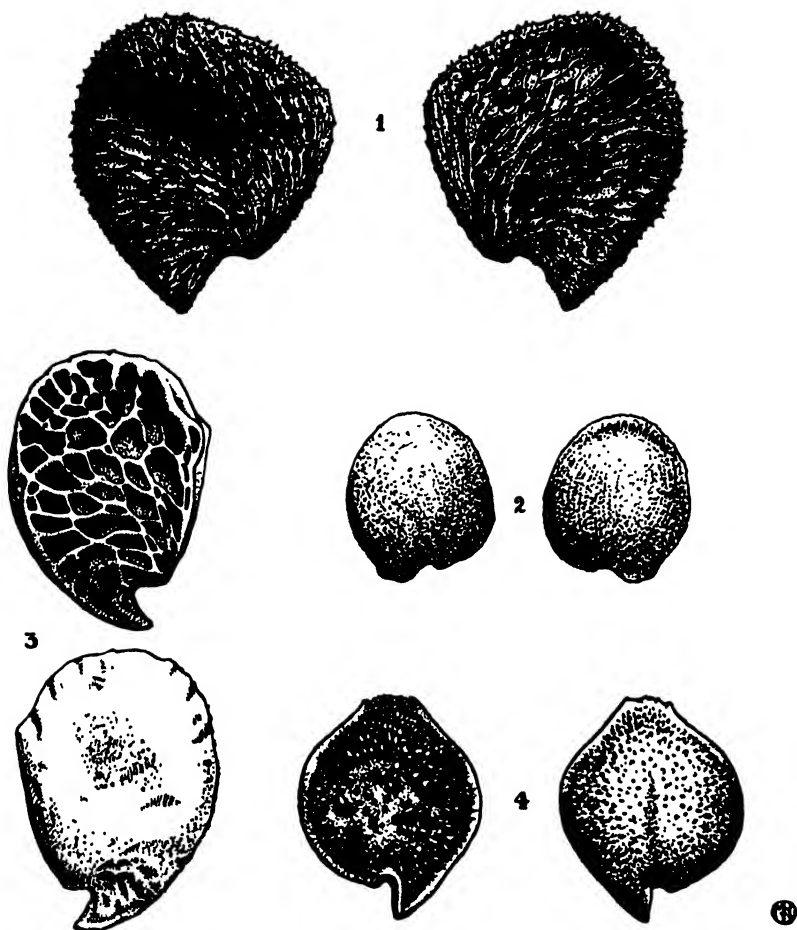


Fig. 6. Seeds of species of *Pseuderanthemum* Radlk. (all  $\times 6$ ). 1, *P. Ludovicianum* (Büttner) Lindau; 2, *P. tunicatum* (Afzel) Milne-Redhead; 3, *P. Hildebrandtii* Lindau; 4, *P. dispermum* Milne-Redhead.

Bot. 18, 308 (1880); C. B. Cl. in Dyer, Fl. Trop. Afr. 5, 171 (1899); S. Moore in Cat. Pl. Talb. Nigeria, 140 (1913); De Wild. in Bull. Jard. Bot. Brux. 7, 75 (1920); Hutch. & Dalz. Fl. W. Trop. Afr. 2, 262 (1930); Irvine, Pl. Gold Coast, 183 (1930). *Pseuderanthemum nigrificatum* Radlk. in Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. 13, 286 (1883); Lindau in Engl. & Prantl, Pflanzenfam. 4, 3B. 330 (1895); Th. Dur. & De Wild. Mat. Fl. Cong. 1, 37 (1897); De Wild. & Th. Dur. Contr. Fl. Cong. 1, 46 (1899); Hiern. in Cat. Welw. Afr. Pl. 1, 818 (1900); De Wild. Étud. Fl. Bas- et Moyen-Cong. 1, 320 (1906), 3, 273 (1910), 3, 481 (1912); S. Moore in Journ. Bot. 45, 92 (1907); Th. & Hel. Dur. Syll. Fl. Cong. 429 (1909); De Wild. Pl. Thonn. 2, 385 (1911); Étud. Fl. Kat. 2, 148 (1913); Contr. Fl. Kat. 203 (1921); Pl. Bequaert. 4, 30 (1926); S. Moore in Journ. Bot. 68,



Suppl. 2, 136 (1930). *Eranthemum Lindaui* C. B. Cl. in Dyer, Fl. Trop. Afr. 5, 173 (1899).

SIERRA LEONE. Freetown, *Dalziel* 948 ; Njala, *Deighton* 1079, 1756 ; Port Loko, *Glanville* 260 ; without locality, *Afzelius* s.n. (type), *Thomas* 7943, 10082, 10517 ; Kukuna, *Scott-Elliot* 4692 ; Bowya, *Bunting* 17.

GOLD COAST. Assin Yan to Kumasi, *Cummins* 237 ; Banka, *Irvine* 492 ; Abetifi, Kwahu, *Irvine* 1665 ; Sunyani, *Chipp* 74 ; Nkwanta, *Chipp* 64 ; Kaforidua Hills, *Johnson* 440 ; without locality, *Farmar* 518 ; *Moor* B30.

TOGO. Without locality, *Baumann* 375.

NIGERIA. Lagos, *Barter* 3300 (type of *Eranthemum nigritianum* T. Anders.) ; Oban District, *Talbot* 1356, 1392, 1435, 1436, 1448, 1538, 1578 ; without locality, *Thomas* 2309 ; *Rosevear* 10/30 ; *Kennedy* 2186, 2092 ; *MacGregor* 504.

BRITISH CAMEROONS. Victoria, *Preuss* 1108 ; without locality, *Preuss* 1366 ; Johann-Albrechtshöhe, *Staudt* 561.

FERNANDO Po. *Mann* 156.

CAMEROONS. Jaunde, 800 m., *Zenker & Staudt* 581 ; Bassa near Duala, *Dalziel* 8155 ; Bipinde, *Zenker* 1672, 2811, 4336, 4808, 4894, 4960 ; Batanga, *Bates* 23 ; Edea, *Buesgen* 364 ; without locality, *Bates* 686.

GABON. Gabon River, *Mann* 997 ; Sierra del Crystal, *Mann* 1708 ; Angoni, 70 miles east of Gabon, *Bates* 564.

FRENCH CONGO. Loango, *Soyaux* 135.

PORTUGUESE CONGO. Mayumbe, Hombe region, R. Lufo, *Gossweiler* 7954 ; Nkanda Mbaku, *Gossweiler* 9045.

BELGIAN CONGO. LuaLa, *Vanderyst* 10018 ; Bingila, *Depuis* s.n. ; Sanda, *Gillet* 3318 ; Ganda-Sundi, 350 m., *Goossens* 1088, 1137 ; Kizu, *Wellens* 199 ; Bokala, *Vanderyst* s.n. ; valley of the Djuma, *Gillet* 2841b, 2864 ; Nioki, *Goossens* 6094 ; Eala, *Pynaert* 866 ; Mongo near Eala, *Laurent* 1099 ; Likimi, *Malchair* 4 ; Mobwasa, *Reygaert* 1457 ; island above Upoto, *Laurent* s.n. ; Dondussana, *Morethan* 850, 901 ; Bomane, *Laurent* 1425 ; Nala, *Seret* 757 ; between Ipamu and Panga, *Vanderyst* 9550 ; near Ipamu, *Vanderyst* 9937 ; Panga, *Bequaert* 1533 ; Avakubi, *Bequaert* 1913 ; Penghe, *Bequaert* 2094, *Putnam* 88 ; Bena-Dibele, *Flamigni* 126 ; Port Franqui, *Vanderyst* 24354, 24385 ; Kimbwa, *Vanderyst* s.n. ; Kito, ; *Georgery* 209 ; between the Lubile and the Lukaya, *Vandermeiren* s.n. ; without locality, *Briey* s.n.

UGANDA. LuaLa, 1200 m., *Dummer* 3976 ; Mubango, 1200 m., *Dummer* 4465 ; Wini, Toro, 1050 m., *Bagshawe* 1039 ; Ngusi River, Lake Albert, 900 m., *Bagshawe* 1371 ; Budongo Forest, *Eggeling* 2273.

TANGANYIKA TERRITORY. Maschana, Usambara Mts., *Holst* 3494 (type of *Eranthemum Lindaui* C. B. Cl.) ; Amani, *Warnecke in Herb.* *Amani* 239 ; *Grote in Herb.* *Amani* 6314 ; Mombo, *Engler in*

*Herb. Amani* 3257 ; Rau Forest, Moshi, 700 m., *Lewis* 235 ; Pare District, Bombo, 1300 m., *Haarer* 1488 ; Morogoro District, Uluguru Mts., 1250 m., *Schlieben* 2695.

NORTHERN RHODESIA. Abercorn District, south-west of Lake Tanganyika, 1200 m., *Hutchinson & Gillett* 3980.

ANGOLA. Pungo Adongo, Mata de Pungo, *Welwitsch* 5177, 5192 ; Amboim, *Gossweiler* 4487.

Like *P. Ludovicianum* (Bütt.) Lindau, this species is an inhabitant of the evergreen forests, but its distribution is much wider, for it is also found in the fringing forests in the higher and drier parts of the continent.

**7. *Pseuderanthemum dispernum* Milne-Redhead, sp. nov. ;** ab omnibus speciebus africanis generis capsulis dispermis seminibus muricatis differt. *P. nigritianum* Lindau in Schlecht. Westafr. Kautschuk-Exped. 316 (1900), non Radlk. *Eranthemum hypocrateriforme* S. Moore in Cat. Pl. Talb. Nigeria, 140 (1913), non Roem. & Schultes.

*Frutex* vel suffrutex, magnitudine ignota. *Ramuli* parce pubescentes, demum laeves, pallidi, internodiis 0.5–4.5 cm. longis. *Folia* elliptica vel anguste obovata, leviter acuminata, subacuta, basi in petiolum attenuata, usque 13 cm. longa et 4.5 cm. lata, subglabra vel parcissime hirsuta, supra cystolithis minutis instructa ; petiolus usque 1 cm. longus ; folia superiora minora, suborbicularia, apiculata, circiter 1.5 cm. diametro. Inflorescentiae usque 20 cm. longae, terminales vel axillares, interruptae, simplices vel basi furcatae ; rhachides brevissime hirsutae et stipitato-glandulosae ; nodi multi, 2–3-flori ; internodia usque 2.5 cm. longa ; bracteae et bracteolae lineari-subulatae, minutae, circiter 4 mm. longae, puberulae et glandulosae. *Calyx* alte 5-fidus ; segmenta lineari-subulata, circiter 6 mm. longa, puberula et glandulosa. *Corollae* *tubus* tenuiter cylindricus, leviter arcuatus, apice leviter inflatus, circiter 3 cm. longus et 1 mm. diametro ; limbus patens, 5-partitus, circiter 3 cm. diametro ; lobi subaequales, coccinei, ovati, 8 mm. lati. *Stamina* 2, sub fauce affixa ; filamenta brevia ; antherae dithecae, thecis muticis, 2 mm. longae, exsertae ; staminodia 2, brevissima. *Ovarium* oblongum, circiter 2 mm. longum, 4-ovulatum ; stylus filiformis, circiter 3 mm. longus ; stigma inclusum, minutum, capitatum. *Capsula* disperma, ovulis inferioribus abortivis, circiter 15 mm. longa, inferne in stipitem 8 mm. longum contracta, apice brevissime rostrata. *Semina* suborbiculata, plano-compressa, 4 mm. diametro, brunnea, muricata, praecipue in latere interiore.

NIGERIA. Oban, *Talbot* 1552 (type in Kew Herb.) ; Okuri, Cross River, *Holland* 172. Agoi Efut—Ukwop Eyere, *Rosevear* 30/31.

BRITISH CAMEROONS. Meandja, 600 m., *Schlechter* 12681.

CAMEROONS. Bipinde, *Zenker* 1667.

In general appearance this species is very similar to *Ruspolia decurrens* (Hochst. ex Nees) Milne-Redhead, and agrees with it in possessing glandular hairs on the inflorescence, but is easily separable on account of its bilocular anthers, its small two-seeded capsules and its seeds. Strange to say it has not been confused with this species but has been found in herbaria both under *Ruspolia hypocrateriformis* (Vahl) Milne-Redhead and *Pseuderanthemum tunicatum* (Afzel.) Milne-Redhead. Holland described the flowers as being scarlet with a dark centre, and Schlechter as being brick red, whilst those of *P. tunicatum* are white spotted or flushed with mauve. Its distribution appears to be restricted to a small area about the Gulf of Guinea.

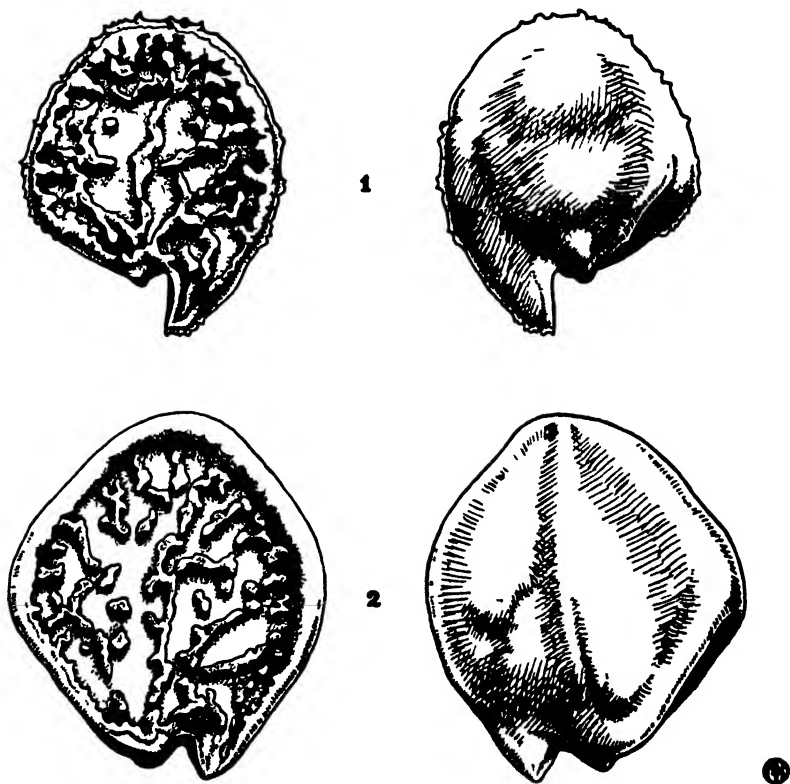


Fig 7 Seeds of species of *Ruspolia* Lindau (all  $\times 6$ ) 1, *R. decurrens* (Hochst ex Nees) Milne-Redhead; 2, *R. seticalyx* (C B Cl) Milne-Redhead

#### KEY TO THE SPECIES OF *Ruspolia* LINDAU

Capsule normally 4-seeded.

Seeds with a marginal rim and a number of irregular raised walls on the otherwise smooth inner surface.

- Inflorescence up to 3 dm. long ; rhachis and calyx with stalked glands as well as hairs ; capsule less than 3 cm. long ; seeds with marginal rim, lower than the irregular walls on the inner surface, transversely less than 6 mm. in diameter..... 1. *decurrens*
- Inflorescence up to 1.5 dm. long ; rhachis and calyx without stalked glands ; capsule more than 3 cm. long ; seeds with marginal rim higher than the irregular walls on the inner surface, transversely more than 6 mm. in diameter ..... 2. *seticalyx*
- Seeds with a marginal rim to the otherwise smooth inner surface ; capsule about 4 cm. long.
- Seeds round in outline with a thick rather wide rim, transversely 7 mm. in diameter.....3. *hypocrateriformis*
- Seeds rather angular in outline, with a thin and narrow rim, transversely 8-9 mm. in diameter...3a. *hypocrateriformis* var. *australis*
- Capsule normally 2-seeded, about 4 cm. long ; seeds with a rather irregular wide marginal rim, and a longitudinal ridge crossing the otherwise smooth inner surface .....4. *pseuderanthemoides*

#### ENUMERATION OF THE SPECIES OF RUSPOLIA LINDAU

1. *Ruspolia decurrens* (Hochst. ex Nees) Milne-Redhead, comb. nov. *Eranthemum decurrens* Hochst. ex Nees in DC. Prodr. 11, 453 (1847) ; A. Rich. Tent. Fl. Abyss. 2, 158 (1851) ; C. B. Cl. in Dyer, Fl. Trop. Afr. 5, 170 (1899) ; Broun and Massey, Fl. Sudan, 343 (1929). *Eranthemum senense* Klotzsch in Peters, Reise Mossamb. Bot. 219 (1861) ; C. B. Cl. in Dyer, Fl. Trop. Afr. 5, 171 (1899). *Pseuderanthemum decurrens* Radlk. in Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. 13, 286 (1883) ; Lindau in Engl. and Prantl, Pflanzenfam. 4, 3B. 330 (1895) ; A. Chev. Études. Fl. Afr. Centr. Franç. 1, 236 (1913). *Pseuderanthemum senense* Radlk. in Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. 13, 286 (1883) ; Lindau in Engl. and Prantl, Pflanzenfam. 4, 3B, 330 (1895).

FRENCH EQUATORIAL AFRICA. Upper Shari, Gribingui, *Chevalier* 6453 ; Upper Oubangui, between Mandjaffa and Bousso, *Chevalier* 10461.

ANGLO-EGYPTIAN SUDAN. Kordofan, *Kotschy* 276 (type) ; *Pfund* 435, 444 ; District of Dilling, *Andrews* 16 ; Kharraba, *Aylmer* 15 ; Dimo, near Wau, *Schweinfurth* 4264 ; Blue Nile, *Muriel* 4/51 ; Shambe, Bahr el Jebel, *Broun* 1424.

ABYSSINIA. Tacaze River, *Schimper* 773 ; without locality, *Quartin-Dillon & Petit* 2398 ; Aethiopia, without locality, *Kotschy* 450.

TANGANYIKA TERRITORY. Malendula, east of Mahenge, 400 m., *Schlieben* 2342 ; Lindi District, Mt. Mtandamula, *Busse* 2719.

PORTUGUESE EAST AFRICA. Rios de Sena, *Peters* s.n. (type of *Eranthemum senense* Klotzsch); Lupata, *Kirk* s.n.

NYASALAND. Near Mt. Chiradzulu, *Cameron* 184.

SOUTHERN RHODESIA. Hot Springs, *Myers* 689.

NORTHERN RHODESIA. Livingstone District, Bombwe Forest, *Martin* 238.

The indumentum character used by Clarke to separate *Eranthemum senense* Klotzsch from *E. decurrens* Hochst. ex Nees breaks down completely in the light of additional material, and the writer finds himself forced to unite these two species, in spite of their interrupted distributions, for the species is as yet entirely unknown from Uganda, Kenya Colony and northern Tanganyika Territory.

**2. *R. seticalyx* (C. B. Cl.) Milne-Redhead**, comb. nov. *Eranthemum seticalyx* C. B. Cl. in Dyer, Fl. Trop. Afr. **5**, 172 (1899). *Pseuderanthemum seticalyx* Stapf in Bot. Mag. **135**, t. 8244 (1909).

BELGIAN CONGO. Katanga, R. Choma between Lakes Moero and Tanganyika, *Descamps* s.n.; Kitchema, *Descamps* s.n.; Pweto, Lake Moero, *Robyns* 1997.

TANGANYIKA TERRITORY. Shinyanga, 1200 m., *Bax* 342; *Burt* 5118, 5195; Singida District, Matelele, 1200 m., *Burt* 1383; Mpwapwa, *Hornby* 117, *Burt* 3878; Mbeya District, Mbozi, Kitete, 1200 m., *Davies* 488; Mts. east of Lake Nyasa, *Johnson* s.n.; Namguru, near Lindi, *Busse* 2960. Lake Rukwa, Milepa, *Michelmores* (Hort. Kew).

NYASALAND. Kondowe to Karonga, 600–1800 m., *Whyte* s.n. (type); Songue to Karonga, 500–600 m., *Whyte* 6; Zomba Rock, *Whyte* s.n.; Manganja Hills near Shibisa [Chikwawa], 60–90 m. *Kirk* s.n.; without locality, *Buchanan* 302, 1204; Blantyre, *Simon* s.n.; Likoma Island, *Johnson* 94; Nyika Plateau, Nwanemba, 2400 m., *McClounie* 102.

SOUTHERN RHODESIA. Kariba Gorge on the Zambezi, *Haviland* in *Herb. Eyles* 4920.

*R. seticalyx* is a distinct species recognised at once by its seeds. It is confined to the highlands of eastern Africa. A specimen collected by Schlieben (no. 2047) at Mahenge, Tanganyika Territory, comes very near to this species, but differs from the typical plant in its longer and more robust inflorescence, its wider bracts and its calyx pubescent inside. Until its fruits and seeds are known the writer prefers to leave it undescribed.

**3. *R. hypocrateriformis* (Vahl) Milne-Redhead**, comb. nov. *Justicia hypocrateriformis* Vahl, Enum. **1**, 165 (1805); Schumacher & Thonn. Beskr. Guin. Pl. **11** (1827). *Eranthemum hypocrateriforme* Roem. & Schultes, Syst. **1**, 175 (1817); Nees in DC. Prodr. **11**, 454 (1847); Benth. in Hook. Niger Fl. 484 (1849); T. Anders. in Journ.

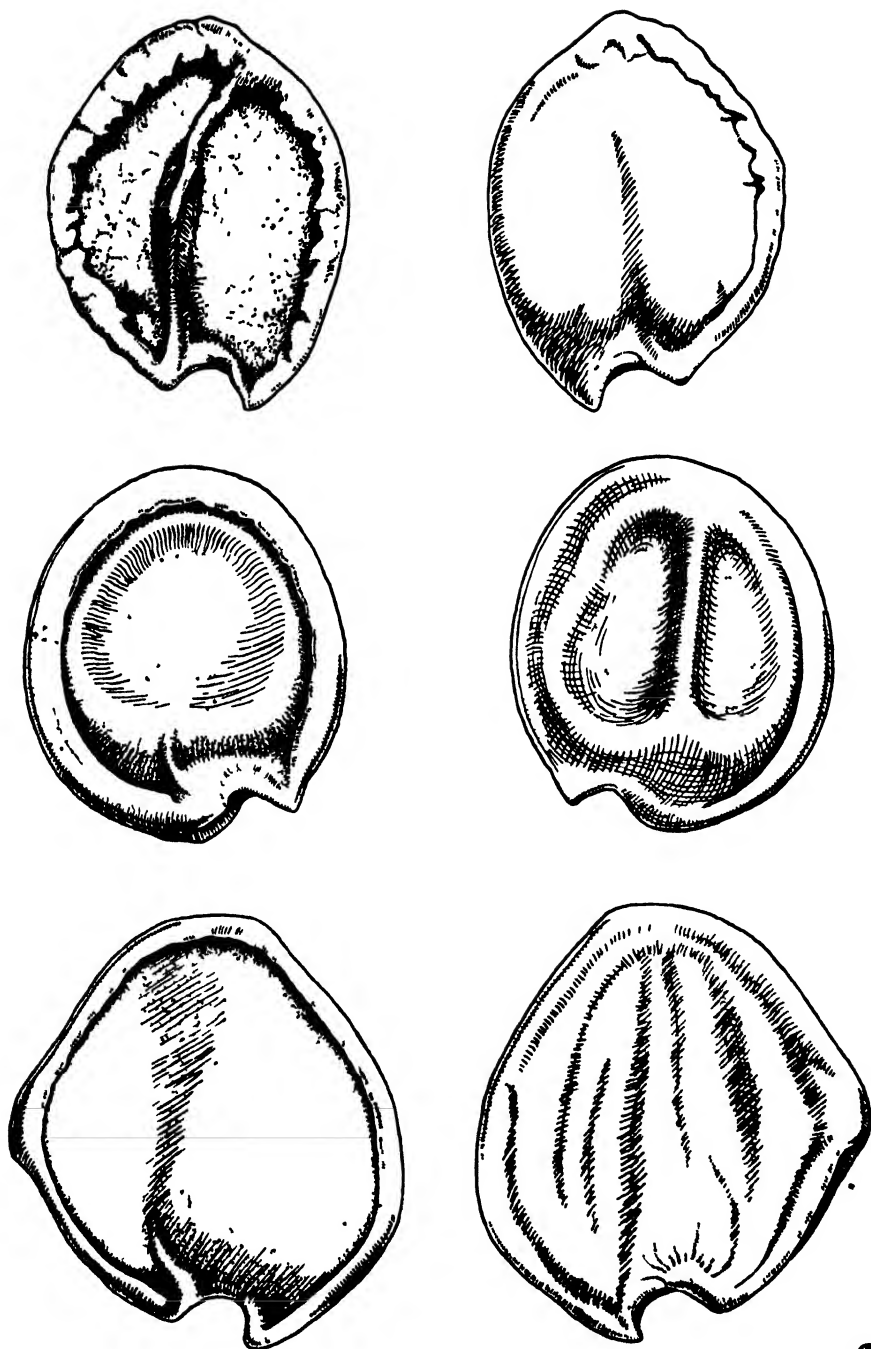


Fig 8 Seeds of species of *Ruspolia* Lindau (all < 6)  
 1, *R. pseuderanthemoides* Lindau, 2, *R. hypocrateriformis* (Vahl)  
 Milne-Redhead, 3, *R. hypocrateriformis* var. *australis* Milne-Redhead

Linn. Soc. Bot. 7, 52 (1864) ; Hook. f. in Bot. Mag. 101, t. 6181 (1875) ; C. B. Cl. in Dyer, Fl. Trop. Afr. 5, 171 (1899) ; De Wild. in Bull. Jard. Bot. Brux. 7, 75 (1920) ; Irvine, Pl. Gold Coast, 183 (1930) ; Hutch. & Dalz. Fl. W. Trop. Afr. 2, 262 (1930). *Eranthemum affine* Spreng. Syst. 1, 89 (1825). *Pseuderanthemum hypocrateriforme* Radlk. in Sitzb. Math.-phys. Cl. Akad. Wiss. Muench. 13, 286 (1833) ; Lindau in Engl. & Prantl, Pflanzenfam. 4, 3B. 330 (1895), p.p. ; S. Moore in Journ. Bot. 68, suppl. 2, 136 (1930).\* *P. decurrens* A. Chev. Expl. Bot. Afr. Occ. Franç. 1, 500 (1920), non Radlk.

SENEGAL. Dakar, 15 m., *Vigne* 1773 ; *Vermoesen* 1012 ; Casamance, Carabane, *Chevalier* 2795.

SIERRA LEONE. Without locality, *Vogel* 159 ; *Winwood Reade* ; *Smeathman* ; *Unwin & Smythe* 22 ; Wallia on Scarcies River, *Scott-Elliot* 4451 ; near top of Sugarloaf, *Scott-Elliot* 4028.

GOLD COAST. Accra, *Don* 11 ; *Dalziel* 72 ; *Deighton* 617 ; Aburi Hill, 180 m., *Lloyd Williams* 288 ; Aburi, *Howes* 1015 ; Achimota, *Irvine* 144 ; without locality, *Farmer* 469 ; Volta River District, 60–120 m., *Moor* 240.

TOGO. Lome, *Warnecke* 7, 8, 386.

NIGERIA. Eruva, *Rowland* s.n.

BELGIAN CONGO. Leopoldville, *Vanderyst* 3018 ; Yambata, *De Giorgi* 1753 ; *Vermoesen* 130 ; Kisantu (cult.) *Vanderyst* 13568.

ANGOLA. Cuanza, between Casal and Mubela, *Gossweiler* 8418.

**3a. *R. hypocrateriformis* (Vahl) Milne-Redhead var. *australis* Milne-Redhead**, var. nov. ; habitu *R. hypocrateriformis* (Vahl) Milne-Redhead similis sed seminibus majoribus margine angustiore differt.

*Frutex* laxus ; rami arcuati, usque 3 m. longi ; ramuli leviter angulati, cortice pallide brunneo tecti, novelli pilis brevibus crispidulis induti. *Folia* ovata, leviter acuminata, subacuta, basi in petiolum attenuata, usque 12 cm. longa, 5 cm. lata, novella puberula, nervis leviter hirsutis, demum glabra, supra cystolithis minutis dense instructa ; petiolus usque 2 cm. longus. *Inflorescentiae* paniculatae, multiflorae, congestae, usque 6 cm. longae ; bractaeae et bracteolae lanceolatae vel anguste deltoideae, acutae, 4–11 mm. longae, inferne 1–2 mm. latae, puberulae, ciliatae. *Calyx* alte 5-fidus, 7 mm. longus ; segmenta lineari-subulata, circiter 6 mm. longa, leviter puberula et minute ciliata. *Corollae* tubus tenuiter cylindricus, leviter arcuatus, apice oblique infundibuliformis, usque 2.8 cm. longus et 1.5 mm. diametro, extra parce glandulosus ; limbus patens, 5-partitus, circiter 2 cm. diametro ; lobi subaequales, coccinei, obovati, circiter 9 mm. longi, 5 mm. lati. *Stamina* 2, sub fauce affixa ; filamenta circiter 3 mm. longa ; antherae monothecaeae, loculo 1 mm. longo mutico, exsertae. *Ovarium* conicum,

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\* for var. *breviflorum* S. Moore see p. 274

circiter 3 mm. longum, 4-ovulatum; stylus filiformis, glaber, circiter 2.8 cm. longus; stigma exsertum, minutum, capitatum. *Capsula* 4-sperma vel abortu disperma, usque 4 cm. longa, inferne in stipitem 15 mm. longum contracta, apice acuta, vix rostrata. *Semina* plano-compressa, suborbiculata vel rotundato-triangularia, basi inaequale biloba, lobo minore obtuso-hilifero, lobo majore apice leviter incurvo acuto, laevia, latere interiore margine angusto corneo instructa, usque 9 mm. diametro.

TRANSVAAL. Zoutpansberg: Wylies-poort, April 1934, *Schweickredt & Verdoorn* 441 (type in Nat. Herb. Pret.):—shrub with arching branches over 3 m. long, hanging over stones; flowers scarlet; anthers 2, scarlet, exserted; corolla-tube cricked at the throat; corolla-lobes abruptly spreading, three somewhat larger than the remaining two. Wylies-poort, hanging down shrubby bank by roadside, 15 April 1934, *Schweickerd & Verdoorn* 673:—flowers scarlet. Wylies-poort, 28 April 1931, *Pole Evans* 3338 (34), in part.

The writer finds that it is impossible to consider this southern *Ruspolia* anything but a variety of the West African *R. hypocrateriformis* as in the flowering state they are quite indistinguishable from dried material.

A specimen collected by Miss Myres (no. 680) in the Melsetter District of Southern Rhodesia may be *Ruspolia hypocrateriformis* var. *australis*, but it is in young fruit and the seeds are too immature for certain identification. *Monro* 2335 in the British Museum Herbarium may also be this variety, but here again the material is too young.

4. *R. pseuderanthemoides* *Lindau* in Ann. Istit. Bot. Roma, 6, 80 (1896). *Eranthemum hypocrateriforme* *Rendle* in Journ. Bot. 34, 398 (1896), non Roem. & Schultes.

ABYSSINIA. R. Dawa at Uelbe, *Riva* 1418 (type); Sheik-husin, *Donaldson Smith* s.n.

#### DOUBTFUL SPECIES.

*Eranthemum plumbaginoides* *P. Maury* in Journ. de Bot. 2, 264, cum ic. (1888).

GABON. Libreville, *Chateau*.

The species was described from a cultivated plant, and no specimen appears to have been preserved. The description and illustration are not sufficiently detailed to allow of definite identification, but the writer feels certain that *E. plumbaginoides* is either *Pseuderanthemum Lindavianum* or a form of *P. tunicatum*.



## EXCLUDED SPECIES.

***Pseuderanthemum hypocrateriforme* Radlk. var. *breviflorum* S. Moore.** in Journ. Bot. 68, suppl. 2, 136 (1930) = ***Pseuderanthemum kewense* L. H. Bailey,** Gentes Herb. 1, 130 1923. *Eranthemum atropurpureum* Hook. f. in Bot. Mag. 128, t. 7839 (1902), non Bull.

The above variety was founded on *Gossweiler* 1524. In his notes accompanying the specimen, Gossweiler says "A shrub some 4 ft. high, sparingly branched; leaves dark purplish red above glossy, purplish green beneath, flowers white with violet markings round the throat. Cultivated at Loanda Public Gardens brought from Cabinda (Portuguese Congo) by myself where I received it from the Government Garden." This is undoubtedly *P. kewense*, a species which is probably a native of one of the Polynesian islands, and which has been cultivated in Botanic Gardens for some years as an ornamental foliage plant.

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## XXVIII—NEW OR LITTLE KNOWN PLANTS FROM SOUTH INDIA: VII \*

N.B.—The localities in round brackets after the name of the species indicate the locality noted in the Flora of the Madras Presidency.

***Hibiscus canescens* Heyne** [Malvaceae];  
(Deccan and Carnatic).

TINNEVELLI DISTRICT: in the hills near Mundanthorai, *E. Barnes* 1231. Leaves and flowers have a tendency to droop.

***Quisqualis malabarica* Bedd.** [Combretaceae];

This species is described as a large climber with opposite leaves, but Dr. Barnes has collected erect specimens in flower, under 20 inches in height, on which the leaves are mostly alternate.

TRAVANCORE: at the foot of the Ponmudi Hills, in evergreen forest, fls. May, *E. Barnes* 1225, 1226.

***Strobilanthes Wightianus* Nees** [Acanthaceae];

Dr. E. Barnes records a general flowering of this species on the Nilgiri Downs in 1934.

***Andrographis elongata* T. And.** [Acanthaceae];

(W. Ghats, hills of Tinneveli).

CHINGLEPUT DISTRICT, near Tambaram: at Puthur, fls. and frt. March, *E. Barnes* 92; at Mullumalai, fls. & frt. Feb., *E. Barnes* 1061. There is also a sheet in the Kew Herb. collected at Chingleput (*Gamble* 13865) which is noted "cult.?" ; in view of Dr. Barnes' find, this specimen is also probably wild.

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\* Continued from K.B. 1935, 160.

**Peperomia dindigulensis** *Miq.* [Piperaceae] ;

NILGIRI HILLS : Ouchterlony Valley, fls. May, *E. Barnes* 1119, 1209.

Upper surface of fleshy leaves flat, dark-olive-green, lower surface convex, dark-red.

**Eulophia nuda** *Lindl.* [Orchidaceae] ;

COORG : Mercara, fls. June, *E. Barnes* 1254. Flowers dark-liver coloured.

**Rhynchosstylis latifolia** *C. E. C. Fischer* [Orchidaceae] ;

(Mysore at Cardamonai)

COORG : near Mercara, fls. June, *E. Barnes* 1210, 1218.

Sepals bright-green, becoming brownish-purple along the keel ; lateral petals very light-green, almost white, with brownish markings on the back ; lip violet round the mouth, lobe on underside of lip and sac white.

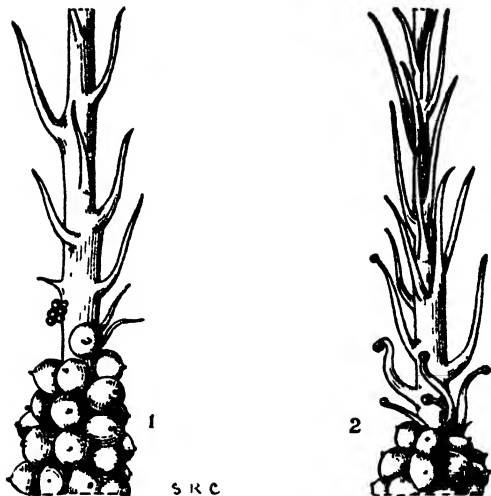
**Ariopsis peltata** *Nimmo* [Araceae] ;

(W. Coast and Ghats ; from sea-level to 4,000 ft.)

TRAVANCORE : near Munnar, on rocks at 5,000 ft., fls. May, *E. Barnes* 1087. Spathe light-cream coloured, speckled externally with brownish-pink especially on the veins and a few reddish freckles on the inside ; ovaries white with brownish-green ridges or pale-green with darker ridges ; stigmas white ; ♂ fls. strawberry-coloured, pale-yellow round the pores.

**Arisaema attenuatum** *E. Barnes et C. E. C. Fischer*, sp. nov. [Araceae-Araeae] ; ab *A. tylophoro* C. E. C. Fischer folioliis sessilibus nervis numerosioribus marginibus undulatis, spathae limbo elongato-triangulari, cauda nec spathae nec spadiceis capitata differt.

Dioecious, succulent, glabrous *herb.* *Tuber* oblate, 2–3 cm. diam., covered below with the remains of the old tuber. *Cataphylls* 3 or more, membranous, innermost up to 21 cm. long, beautifully mottled by longitudinal dark-purple markings on a greenish and brown striated ground. *Leaf* solitary ; petiole rather slender, up to 80 cm. long, often very conspicuously mottled, the basal 2/3 closely sheathing the peduncle, the 2 edges overlapping and united for a few centimetres at the base by a membrane ; leaflets radiate, 9–13 in ♀ plants and 6–12 in the ♂, elliptic-lanceolate to oblanceolate, finely acuminate, tapering at the base, sessile, 12–22 cm. long 2–5.5 cm. wide, dark-greenish and dull above, slightly lighter and somewhat glossy below, primary nerves 18–25, 3–4 mm. apart, arising at an angle of 45° from the midrib, running into an intramarginal vein 2–5 mm. from the strongly undulate margin. *Peduncle* slender, entirely enclosed in the petiole-sheath or exerted up to 10 cm. *Tube of spathe* cylindric or very slightly widened upwards, 7–9 cm.



*Arisaema attenuatum* Barnes et Fisch. ♀ inflorescence  $\times 3$ .

1. showing one ♂ flower above ♀ inflorescence. 2. showing lowest neuters tipped with rudimentary anthers.

long, 1–1.5 cm. diam., mouth not or slightly revolute, base with a small aperture between the edges, outside with bright-green stripes on a whitish ground, inside glossy with the posterior stripes dark-purple; *limb* elongate-lanceolate, 4–6 cm. long, long-acuminate, the apical portion curved over and pointing downwards, with a large roundish white patch at the base, uniform bright-green above with a few purplish markings at the junction of the green and white. *Spadix* 8–10 cm. long, tapering more or less uniformly from base to the slender, acute tip, the last centimetre or so curved at right angles and shortly exserted from the mouth of the spathe; appendix green, the tip yellowish-green and minutely warted. *Female inflorescence* 2 cm. long; ovaries crowded, subglobose, green; stigma almost sessile, white-papillose; ovules 5–7; neuters few to many scattered over a length of 2–3 cm. above the ovaries, slender, erect, subulate, 4–10 mm. long, green, sometimes a few of the lowest purple-tipped. *Male inflorescence* 3–4 cm. long, starting from the base or leaving 3–4 mm. of naked spadix below, flowers scattered or crowded at the base and distant above, consisting of 1–7 sessile, purple anthers opening by an apical pore; pollen-grains spherical, slightly echinate, purple, 0.015 mm. diam. *Fruit* not seen.

TRAVANCORE: High Range, plentiful in evergreen forest and shady grassy places near Munar, 5,000 ft., flowers May, *E. Barnes* 1193 (♀, type sheet, and inflorescence in spirit in Herb. Kew.), 1079 (♂ & ♀), 1145, 1198 (whole plants), 1200 (leaf).

Of 58 plants 40 were ♂, 18 ♀; about half the ♂ had 7 or 8 leaflets and half the ♀ had 10.

There has been some controversy regarding the origin of the neuters in *Arisaema* and allied genera. Engler (Pflznr. IV. 23 F, 17)

appears to imply that in dioecious species the neuters on the ♀ plants are pistillodes. This would not appear to be the case in the present species. On the ♀ spadix on the sheet *Barnes* 1079, there is a single ♂ flower immediately above the uppermost ovary. On sheet 1193, on one of the ♀ spadices several of the lowest neuters are tipped with a definite rudimentary purple anther, and several higher ones are provided with minute purple-knobbed tips. It is evident, therefore, that these are rudimentary ♂ flowers and it would seem that this dioecious species has evolved from a monoecious one through the degeneration of the ♂ flowers into neuters.

***Arisaema Barnesii* C. E. C. Fischer [Araceae] ;**

NILGIRI HILLS : Ouchterlony Valley, fls. May, *E. Barnes* 1208.

Dr. Barnes makes the following observations on this species : " Is a small slender plant at higher altitudes but becomes a very large, rather succulent one lower down. Many plants were much larger than the one sent." On the plant referred to the leaf has 9 leaflets up to 32 cm. long, 11.5 cm. wide ; primary nerves up to 1.5 cm. apart, intramarginal vein up to 1 cm. from the margin ; petiolules up to 3.5 cm. long ; tube of spathe 8.5 cm. long, limb 6 cm. long with a tail 6 cm. long ; ♀ spadix 9.5 cm. long, the floriferous portion 3 cm. long.

***Arisaema peltatum* C. E. C. Fischer, sp. nov. [Araceae-Araeae] ;**  
*A. Barnesii* C. E. C. Fischer simile, sed foliolis sessilibus angustioribus, spatha minore, limbo erecto, spadicibus nec fusiformibus nec capitatis, stylo longiore, stigmatate peltato.

A dioecious, glabrous *herb.* *Tuber* subglobose, 1–2 cm. diam., flesh white. *Cataphylls* 3, membranous, greenish mottled with dark-purple, innermost up to 15 cm. long. *Leaf* solitary ; petiole up to 60 cm. long, the lower half sheathing the peduncle, conspicuously mottled ; leaflets radiate, 7–11, narrowly elliptic-lanceolate, acuminate or caudate-acuminate, base tapering, sessile, 9–19 cm. long, 1.8–3 cm. wide, green above, whitish below, lateral nerves 12–16, impressed above, arising at an angle of 45° with the midrib, uniting with a longitudinal vein 2–3 mm. within the entire or more or less erose, revolute margin. *Peduncle* slender, rather shorter than the petiole. *Tube of spathe* narrowly funnel-shaped, 3.5–5 cm. long, limb ovate-lanceolate, 4–5 cm. long, tapering into a slender tail 2.5–4 cm. long, the limb bent forward and then upcurved with the tip erect. *Spadix* straight, slightly longer than and exserted from the tube of the spathe, similar in both sexes, slightly larger in the ♀ rather slender, very slightly enlarged above the inflorescence and thence very slightly tapered to a blunt tip. *Female inflorescence* narrowly conical, 2.5 cm. long (only one seen) ; ovaries crowded, subglobose ; style columnar,  $\frac{1}{2}$ – $\frac{1}{3}$  as long as the ovary ; stigma peltate, minutely papillose ; ovules 3–4 ; neuters about 25, extending over 1.5 cm. of the spadix, slender, subulate, acuminate, erect,

up to 1.2 cm. long. *Male inflorescence* 1.7–2 cm. long, flowers scattered or often dense below, consisting of 2–8 anthers on a short column, opening by apical pores; neuters 0. *Fruit* not seen.

TRAVANCORE: High Range, near Munnar, 5,000 ft., flowers May, *E. Barnes* 1147 (♂, type in Herb. Kew.), 1115 (3) (♀ inflorescence), 1142, 1213 (inflorescence in spirit); Munnar-Naimakad, 5000–6000 ft., *E. Barnes* 1141; Munnar Pullivasal, 4500 ft., *E. Barnes* 1146.

***Arisaema Wightii* Schott** [Araceae];  
(Nilgiri Hills)

TRAVANCORE: near the summit of Anaimudi, fls. May, *E. Barnes* 1107, 1108, 1160; often in crevices of rocks; usually with a single leaf.

***Ophioglossum lusitanicum* Linn.** [Filices-Ophioglossaceae];

(This fern is not recorded in Beddome's Ferns of Brit. Ind., but he probably included specimens of it under *O. nudicaule* Linn. f. The habitat of that species, however, is stated as "Anamally Forests, 2500 ft., and elsewhere on the Western Mountains." *O. lusitanicum* Linn. has now been found near the E. Coast).

CHINGLEPUT DISTRICT: near Vandalur, amongst grass in open places and in scrub jungle, 200 ft., *E. Barnes* 298.

## XXIX—NOTE ON THE DISTRIBUTION OF HYPTIS IN THE OLD WORLD. CARL EPLING (University of California).

The genus *Hyptis*, as is well-known, is characteristically American, ranging from California and Florida to Argentina. However, certain species of the sections *Mesosphaeria* and *Cephalohyptis* are widely distributed as weeds in the tropics, not only of America, but of the Old World, where they are often collected and frequently misnamed. It is hoped that the following notes will assist in their determination.

***H. pectinata* Poit.** Ranges in tropical Africa from Sierra Leone eastward to Abyssinia and southward to Angola, Rhodesia, Tanganyika, Nyasa and Madagascar. It is rarely collected in the East Indies, having been found in Java and Guam.

***H. spicigera* Lam.** (*H. americana* Urban, non *H. americana* Briq.). Widely distributed throughout the East Indies where it is more often collected than in the Americas, and in Africa where it has been found in Senegal, Sierra Leone, Nigeria, the Sudan, the Congo, Nyasa and Madagascar. It is also found in Guam. It is probably Brazilian in origin.

***H. suaveolens* Poit.** Abundant throughout the East Indies from Hong Kong and Formosa to Queensland and westward to Bengal and Madras. In Africa it occurs at least in Senegal, French Guinea, Sierra Leone, Liberia and Nigeria.

**H. atrorubens** *Poit.* var. **africana** Epling var. nov.; a typo floribus paulo majoribus, calycum maturorum tubis 5–8 mm. longis subaequaliter cylindratis, nuculis paulo majoribus rugosioribus quam gynobaseos columella paulo brevioribus differt.

SIERRA LEONE. Near Kitcham, *Scott Elliot* 4343 (typus in Herb. Kew.).

Specimens of Don and Afzelius in the British Museum are more hairy than the American plants and have stouter calyx-teeth. Found in Senegal, Sierra Leone and Liberia. This is the only form of *Hyptis* which suggests the possibility of an Old World nativity. Although abundantly collected in the American tropics I have seen no specimens quite comparable with the African.

**H. rhomboidea** *M. & G.* (*H. capitata* var. *mexicana* Briq. *H. decurrens* Epling). A native of Mexico and now distributed through the East Indies from Hainan and Formosa to the Philippines and Borneo. The species is commonly confused with *H. capitata* from which it may readily be distinguished by the decurrent lines of pubescence on the angles of the stems, the narrower more rhomboidal leaves and larger flowers. I do not believe that *H. capitata* occurs in the Old World.

**H. mariannarum** *Briq.* A native of Mexico also found in Guam and named from an early collection from that island.

**H. conferta** *Pohl* var. **angustifolia** *Benth.* Common throughout the American tropics. Has been collected in Luzon.

**H. brevipes** *Poit.* There are three forms which are commonly referred to *H. brevipes*. The first of these, the plant actually named by Poiteau as may be learned by examination of his type at Paris, is characterized by slender calyx-teeth which are predominantly 1.5–2 mm. long, or even more. The capitula are borne on peduncles which are 3–15 mm. long, rarely if ever longer. The pubescence of the plant, while sparse, is seen to be of a certain order when viewed with a lens. On the upper part of the stem it is always ascending and appressed. The texture of the leaves is also characteristic. The form thus characterized is widely distributed throughout the East Indies, from Hong Kong and Formosa to the Celebes, Borneo, Sumatra and Java. It occurs widely in the New World in South America, the Caribbean Islands, Central America and Mexico. It has not been collected in Africa.

**H. lanceolata** *Poir.* A second form is, for me, clearly defined. This is the plant named *H. lanceolata* by Poir. An authentic specimen is preserved at Paris. While very similar in general aspect to *H. brevipes*, it will be found on examination that the calyx-teeth are shorter and blunter than those of that species, ranging from 1–15 mm. in length, rarely as much as 1.6 mm. As a result, the capitula appear more dense and compact than those of *H. brevipes*. They nevertheless average somewhat more in diameter and are borne on peduncles 0.5–3.5 cm. long. The leaves of this form are usually

glabrous or nearly so and the stems if pubescent are very sparsely so, with appressed ascending hairs. The leaves have a different texture and the plant once recognised has a different aspect. It occurs in the New World in the Guianas, where it is very possibly native, in Bahia, on Trinidad and the Windward Islands, and in Guatemala and Honduras. The only place where it comes in contact with *H. brevipes* is in Bahia and here dubious and apparently intermediate forms have been collected. In the Old World, its distribution is wholly distinct from that of *Hyptis brevipes*, it being confined to Africa, ranging from Ashanti to the Uganda and Nyasa and southward to Angola. It never appears in the East Indies, in Mexico or in Cuba.

**H. lanceifolia** Schum. The third form, which is less clearly defined, is also of narrower distribution. It was named *H. lanceifolia* by Schumacher. An apparently authentic specimen is at Copenhagen. It is more or less intermediate between the two previously characterized, resembling *H. lanceolata* more in habit and nature of the capitula and calyx teeth, but having a pubescence more like that of *H. brevipes*, but somewhat finer and usually much denser. Unlike that form the hairs on the upper part of the stem are not appressed, but are tangled and woolly. If it occurred everywhere in company with one or the other of these forms it might be dismissed at least provisionally as a variant of one or the other. Its distribution in Africa is much the same as that of *H. lanceolata*, ranging from Senegal to Uganda, Nyasa, Tanganyika and Angola. And judging from its occurrence there it is doubtless an introduced plant. In the New World where it is native, however, it occurs in Cuba, in Pinar del Rio and on the Isle of Pines, a region where I have observed a number of endemic species of *Labiatae*. In this locality it is very well marked and stable. While *H. brevipes* occurs in Cuba, *H. lanceolata* does not. In view of these facts therefore, I have preferred to maintain these three forms, particularly since they are already named as species, in the belief that ultimate field or garden knowledge of all three forms will discover more weighty differences than appear in the dried specimens. The species of *Hyptis* are frequently very close, particularly in this section.

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**XXX—PLANTS NEW TO ASSAM : VIII\*. C. E. C. FISCHER.**

The previously known distribution, if any, is given between the name of the plant and its locality in Assam.

***Desmodium rufihirsutum* Craib [Papilionaceae].**

Burma, W. China, Siam.

Garro Hills : Baghmara, 500 ft., fls. blue, Nov., Mrs. N. E. Parry 1085. Garo name : Machrukimei.

This plant was also reported from Manipur, collected by A.<sup>o</sup> Meebold and named *D. longibracteatum* by Schindler, but Craib's name was published three years earlier.

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\* Continued from K.B. 1935, 322.

**Photinia Wardii** C. E. C. Fischer, sp. nov. [Pomaceae]; *P. flavidiflorae* W. W. Sm. peraffinis, sed arbuscula scandens, foliis juvenilibus inflorescentiisque dense tomentosis.

A large climber, branchlets purplish-brown, furrowed (at least when dry), lenticellate, glabrous; twigs of the year fuscous-tomentose. *Leaves* elliptic, acute, cuspidate, base rounded, 8–23 cm. long, 4–9 cm. wide, midrib impressed above, prominent below, primary nerves 10–14 pairs forming a wide angle with the midrib, arching and anastomosing near the slightly revolute, narrowly cartilaginous, entire margins, young leaves black when dry, probably red in life, fulvous-flocculent-tomentose below, mature leaves coriaceous, glabrous except for the more or less hairy midrib below; petioles 1–3 cm. long, flocculent-tomentose when young, becoming glabrous and furrowed; stipules early deciduous, caudate-lanceolate, 4–5 mm. long, tomentose. *Corymbs* brachiate and somewhat flat-topped, peduncle, branches and 3–3.5 mm. long pedicels fulvous-tomentose. *Calyx* 2 mm. long, glabrous; tube funnel-shaped; lobes 5, ovate, obtuse, nearly as long as the tube. *Petals* 5, broadly oblong or sub-orbicular, obtuse, 3 mm. long, glabrous. *Stamens* about 20, slightly longer than the petals, glabrous. *Ovary* densely villous, 2-celled; styles 2, free, glabrous. *Fruit* not seen.

Delei Valley, Chibaon, 28° 10' N., 96° 30' E, abundant in the deep forest-filled gullies which score the mountain face, 4000–5000 ft., fls. cream, very fragrant, April, *F. Kingdon Ward* 8042 (type, in Herb. Kew.). "A large climbing shrub ascending to the tree-tops."

**Mercurialis leiocarpa** Sieb. et Zucc. [Euphorbiaceae.]

Korea, Japan, Formosa, China and Siam.

Delei Valley: Chibaon, 28° 10' N., 96° 30' E, on park-like grassy slopes and lawns under scattered great trees with *Viola*, *Coptis*, *Oxalis*, etc., 7000–8000 ft., fls. April, *F. Kingdon Ward* 8078.

**Ficus Wardii**, C. E. C. Fischer, sp. nov. [Moraceae]; *F. infectoriae* Linn. similis, sed foliis scaberulis, petiolis pro rata brevioribus, receptaculis sessilibus, staminibus 2 differt.

A small tree; twigs brown with a reddish tinge, glabrous, longitudinally furrowed (at least when dry), internodes near the apex mostly very short. *Leaves* alternate, chartaceous, ovate or elliptic, acute and cuspidate, base from rounded-truncate to broadly cuneate, 10–20 cm. long, 4.5–10.5 cm. wide, penninerved, midrib prominent, more so below, primary nerves 14–16 pairs, the pairs frequently opposite, the lowest pair at first ascending sharply and then spreading, not continued above the next pair, the remainder parallel, nearly horizontal at their origin and then curving widely upwards, anastomosing near the margin, slightly raised, secondaries more or less parallel to the primary, rather faint and irregular, tertiaries at right angles to the primary, more or less parallel, not quite straight, scaberulous on both faces with minute bristles, margins entire, very narrowly cartilaginous; petioles 1.5–3.5 cm. long, shallowly



channelled above and on both sides, convex below, scaberulous, the bristles denser and mixed with black (when dry) pustules above at the junction with the blade; stipules 1.3–1.7 cm. long, lanceolate, acuminate, glabrous. *Receptacles* (one kind only seen) sessile, in pairs, rarely single in the axils of the terminal leaves or of the prominent circular or oblate leaf-scars just below, nearly globose, shortly umbonate, 1–1.1 cm. diam., brown, minutely puberulous, ♂ and gall flowers mixed throughout; basal bracts minute. *Male flowers* with a pedicel 1.5–1.7 mm. long; perianth-segments 3, 1.3–1.7 mm. long, red, boat-shaped, acute, keeled; stamens 2, filaments very short, anthers short, 2-celled, cells margined. *Gall flowers* sessile or nearly so; perianth-segments 3, red, lanceolate, acute, 1.5–1.8 mm. long; gall stipitate, subglobose, 1 mm. diam.; style lateral, less than half as long as the gall, stigma capitate, puberulous. *Female flowers* and *fruit* not seen.

Delei Valley, Chibaon, 28° 10' N., 96° 30' E, in the lower temperate rain-forest, 6000–7000 ft., fls. April, *F. Kingdon Ward* 8048 (type, in Herb. Kew.).

*Kingdon Ward* 6343 from the Tsangpo Gorge near Ganpo La, 5000–6000, a small tree of 30 ft. in the lower forest, fls. Dec., seems to be the same species, though the internodes of the twigs are much longer and redder, the petioles up to 4.5 cm. long, and the receptacles, also containing only ♂ and gall flowers, are slightly larger and slightly depressed globose.

***Ficus Xiphias* C. E. C. Fischer, sp. nov.** [Moraceae]; *F. Harmandii* Gagnep. similis, foliis penninerviis nervis primariis multo numerosioribus, receptaculis glabris foliis coetaneis axillaribus, floribus masculis cum cecidiophoris passim intermixtis, staminibus 2–3 differt.

A small *shrub* or *tree*, sometimes epiphytic; branchlets slender, reddish-brown, glabrous; twigs of the year dark, at first grey-pubescent, soon glabrous, internodes 4–10 mm. long. *Leaves* alternate, chartaceous, narrowly elliptic-oblong, acute and drawn out into a finely acuminate or blunt tail 2–3 cm. long and 1–2 mm. wide at the base, base of blade cuneate or rounded, 7.5–12.5 cm. long including the tail, 1.4–2.5 cm. wide, glabrous, pale and minutely warted below, penninerved, midrib prominent below, primary nerves 12–22 pairs, parallel, straight, nearly at right angles to the midrib, uniting in a looped vein 0.5–1 mm. within the entire, slightly revolute, narrowly cartilaginous margin, ultimate reticulations fine; petioles very slender, 7–10 mm. long, at first puberulous, soon glabrous; stipules early deciduous, narrowly lanceolate, acuminate, 8–12 mm. long, glabrous. *Receptacles* (only one kind seen) usually 2, sometimes 1, in the axils of the leaves; globose when mature, shortly umbonate, 7–9 mm. diam., glabrous, ♂ and gall flowers mixed throughout; peduncle filiform, 1.4–2 cm. long; basal bracts 3, broadly ovate, obtuse, 1.8–2 mm. long. *Male flowers* with pedicels 0.8–1.5 mm. long; perianth-segments 3–4, boat-shaped, obtuse, 1–1.2 mm. long, reddish;

stamens 2-3, 1 mm. long, anthers as long as the filaments ; pistillode minute. *Gall flowers* sessile ; perianth-segments 4, oblong, boat-shaped, often curved, obtuse or with an incurved acumen, 1.3-1.5 mm. diam. ; style lateral, not reaching to the apex of the gall, with a straight or recurved linear appendage from the side of the rounded apex facing the gall. *Female flowers* and *fruit* not seen.

Delei Valley, 28° 21' N., 96° 37' E, in the rain-forests, 7000 ft., fls. May, *F. Kingdon Ward* 8224 (type, in Herb. Kew.), " a small epiphytic shrub " ; 28° 15' N., 96° 35' E, in rain-forest, southern slope, 7000-8000 ft., fls. Aug. *F. Kingdon Ward* 8556, " a small shrub or tree."

The specific name is prompted by the rough resemblance of the leaves to the fore part of the Sword fish, *Xiphias gladius*.

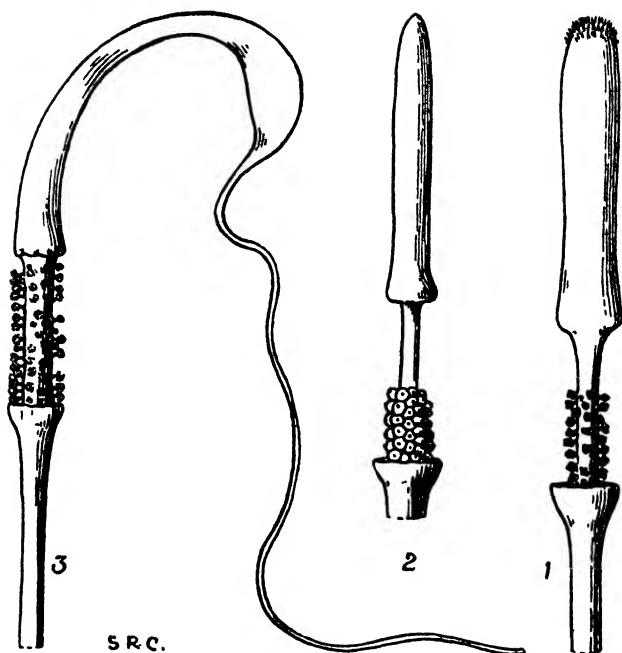
**Hedychium Wardii** C. E. C. Fischer, sp. nov. [Zingiberaceae] ; ab *H. urophylllo* Lodd. foliis majoribus costa subtus villosa vaginis ciliatis, ligulis brevioribus, bracteis obtusis, anthera sessili, differt.

A tall *herb*. *Leaves* sessile, oblanceolate, acute, cuspidate or, shortly caudate, tapered to the base, up to 46 cm. long, 9.5 cm. wide the margins and the midrib below silky villous ; edges of the sheaths silky villous, ligules rounded, 4-10 cm. long, villous-ciliate. *In-florescence* a terminal, ellipsoid cone 10 cm. long, 3 cm. wide (1 only seen). *Bracts* coriaceous, broadly obovate, apex rounded, 4.5-5.5 cm. long, 2.6-3.8 cm. wide, sparsely villous on the back, more or less villous-ciliate, especially along the apical margin, minutely dotted, 3-flowered. *Bracteoles* oblong, truncate, 2.6 cm. long, 1.3 cm. wide hairy on the back, apical margin ciliate. *Ovary* ovoid, 1 cm. long, densely villous ; 3-celled ; ovules numerous on the inner angle of the cells. *Calyx* 3 cm. long, split on one side for  $\frac{1}{2}$  its length, hairy without. *Corolla* bright-yellow, minutely pitted ; tube slender, 6-6.5 cm. long ; lateral petals linear-oblong, 2.3 cm. long, 6 mm. wide, obtuse, anterior petal 3 cm. long, 6 mm. wide, the margins for 3-4 mm. at the apex united to form an acute cone. *Lateral staminodes* narrowly spatulate, rounded, 2.3 cm. long. *Labellum* oblate emarginate, 2.6 cm. long, 3 cm. wide. *Anther* sessile, linear oblong, 8 mm. long. *Stigma* funnel- or bowl-shaped, 2 mm. diam., pilose, *Fruit* not seen.

Delei Valley, 28° 21' N., 96° 37' E, in clumps in open rocky places amongst small trees and shrubs at the bottom of the valley, 5000 ft., fls. July, *F. Kingdon Ward* 8463 (type, in Herb. Kew.). " Flowers very fragrant, in threes but opening one at a time. The bracts become filled with water, which can be poured out in streams when the plant is up-ended, and has a foetid smell."

**Arisaema rhizomatum** C. E. C. Fischer, sp. nov. [Araceae] ; *A. decipiens* Schott affinis, foliis minoribus haud caudatis, petiolulis brevioribus, spathae pallide virentis nigro-maculatae cauda brevior, spadice appendice integra obtusa differt.

Dioecious, glabrous *herb*. *Rhizome* elongate conical, 4-5 cm. long ; root-fibres branched, hairy. *Leaf* solitary (only one seen), pedate ;



1. ♂ inflorescence and spadix of *Arisaema rhizomatum* C.E.C. Fischer, nat. size.
2. ♀ inflorescence and spadix of *Arisaema rhizomatum* C.E.C. Fischer var. *nudum* C.E.C. Fischer, nat. size.
3. ♂ inflorescence and spadix of *Arisaema speciosum* Mart. var. *truncatum* C.E.C. Fischer,  $\times \frac{1}{2}$ .

petiole slender, 33 cm. long, sheathing only near the base, olive brown with scattered whitish marks, crimson near the rhizome; leaflets 5, elliptic-oblong to oblong-lanceolate, acuminate, base narrowed, median 13 cm. long, 4-5 cm. wide, with a petiolule 5 cm. long, lateral smaller with shorter petiolules, primary nerves 8-10. forming a rather wide angle with the midrib, united in a vein 3-5 mm. from the margins. *Peduncle* shorter than the petiole. *Spathe* pale-green, dotted all over with black spots; tube cylindric, 4-6 cm. long, mouth slightly revolute; limb lanceolate to ovate-lanceolate, 6-9.5 cm. long, 3-3.5 cm. wide, acuminate and prolonged into a filamentous tail up to 6 cm. long. *Spadix* straight, the tip only extending above the mouth of the tube. ♂ *inflorescence* 2-2.5 cm. long; anthers 2-3 on a short column, opening by slits. *Appendix* slender for about 1 cm. above the flowers, then truncately swollen to 3-4 times the diameter and then cylindric to a slightly enlarged rounded apex, the crown densely covered with colourless, fleshy, subulate processes. ♀ *inflorescence* nearly cylindric, about 1 cm. long; ovaries crowded, subglobose, style about half as long, stigma small, subpeltate; neuters 0. *Appendix* and *fruit* not seen.

Delei Valley, 28° 15' N., 96° 35' E, 11,000 ft. in *Abies-Rhododendron* forest, fls. Sept., *F. Kingdon Ward* 8627A (type, in Herb. Kew.)

var. **nudum** C. E. C. Fischer var. nov.; omnibus partibus minoribus, appendice graciliore apice subacuta processibus destituta distinctum.

Smaller in all parts. *Cataphylls* 2, papery, narrowed to an obtuse apex, inner up to 6 cm. long, olive-brown with scattered whitish marks. *Leaves* 2, pedately 5-foliolate or sometimes 3-foliolate; petioles 8–16 cm. long, coloured like the cataphylls; leaflets elliptic to oblanceolate, acute and cuspidate, base acute, median 7–11 cm. long, 2.2–3 cm. wide, with a petiolule 6–11 mm. long, primary nerves 6–8, margin slightly revolute, lateral smaller, in the 3-foliolate leaf sessile or subsessile. *Peduncle* 7–12 cm. long. *Spathe-tube* 3.5–4.5 cm. long, limb 3–4 cm. long, 2 cm. wide. *Appendix* more slender with a subacute apex devoid of processes. *Berries* scarlet.

In the same locality as the type, fls. and frt. Sept., *F. Kingdon Ward* 8627B (type, in Herb. Kew).

var. **viride** C. E. C. Fischer var. nov.; simile var. *nudo*, sed spatha pallide viridi immaculata.

*Cataphylls* up to 14 cm. long, subacute, not spotted. *Leaves* 2, 3-foliolate or pedately 5-foliolate; petioles up to 21 cm. long, not spotted; leaflets obovate or oblanceolate, cuspidate, the median 8.5–10.5 cm. long, 3.8–5 cm. wide, lateral smaller and narrower, sessile in 3-foliolate leaves, veins whitish on a glossy dark-green ground, paler below. *Peduncles* up to 15 cm. long. *Spathe* pale-green, unspotted; tube 4–5 cm. long; limb oblong-lanceolate, acuminate, 4.4–5 cm. long with a filiform tail 1–2.5 cm. long. *Appendix* as in var. *nudum*.

In the same locality as the type, under bamboos on the ridge, fls. Sept., *F. Kingdon Ward* 8556 (type, in Herb. Kew.).

**Arisaema speciosum** Mart. var. **truncatum** C. E. C. Fischer var. nov. [Araceae]; a typo spadice supra flores abrupte truncata incrassata differt.

“♂ *spathe* with a very wide (14 cm.) inflated hood bent over and completely protecting the entrance, white-striped on a chocolate ground.” ♂ *inflorescence* 3.4 cm. long; pollen white. *Appendix* truncate and then slightly tapering and curved for 9 cm., then again swollen and strongly recurved for 3 cm. and finally rapidly tapering into a filamentous flagellum 2–3 ft. long.

Delei Valley, 28° 22' N., 96° 37' E, in temperate rain-forest, 6000–7000 ft., fls. May, *F. Kingdon Ward* 8193 (type, in Herb. Kew.); same locality, “Leaf standing 4 ft. high, with a span of 3 ft.”, *F. Kingdon Ward* 8461.

**Arisaema Wattii** Hook. f. [Araceae].

Manipur and Naga Hills.

Delei Valley, 28° 21' N., 96° 37' E., common; scattered on steep slopes in temperate rain-forest, 7000–8000 ft., fls. April, *F. Kingdon Ward* 8243. “*Spathe* variously striped and mottled more or less

chocolate on a greenish ground." Leaves sometimes 5-foliate, and then the 2 outer leaflets narrower with the 2 sides not quite so dissimilar as in the 3-foliate specimens.

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### XXXI—MISCELLANEOUS NOTES.

DR. HUTCHINSON.—Dr. J. Hutchinson has been elected a Correspondent of the Academy of Natural Sciences of Philadelphia.

LORD WAKEHURST.—We record with deep regret the death, on April 30th, of Lord Wakehurst, LL.D., V.M.H., who, as Mr. Gerald Loder, was President of the Royal Horticultural Society from 1929 to 1931.

Lord Wakehurst was a genuine lover of plants, but his interests centred more especially in trees and shrubs, and so far as woody plants are concerned Wakehurst Place, near Ardingly, can assuredly be placed amongst the half-dozen most important gardens in the British Isles.

His collection was as remarkable for its extent as it was for its excellent cultivation and the beauty of its setting. He kept so well abreast of the times that scarcely a new species of any garden value escaped his notice. Favoured with the genial Sussex climate and a good soil he was able sooner than most cultivators to show new introductions at their best.

Wakehurst Place is one of the most famous Elizabethan houses in England and its sylvan setting is appropriately beautiful. The varied surface and contours of the surroundings afford many charming features, one of the most attractive of which is a glade, almost a ravine, extending from near the house to a piece of water.

On its sides are grown many of the larger-leaved rhododendrons recently introduced from China, N. Burma and Tibet. Lord Wakehurst was particularly interested in this genus and in 1921 he presented the Loder Rhododendron Cup to the Royal Horticultural Society.

He had the true collector's spirit as was shown by a remarkable but somewhat motley assembly of shrubs grown in pots which he found room for in cool greenhouses and frames. Of New Zealand and other Australasian shrubs he had a very notable collection and he presented a cup to be awarded annually in New Zealand for the best collection of native plants.

In addition to his Presidency of the Royal Horticultural Society, Lord Wakehurst was also President of the Royal Arboricultural Society, 1926-27. He took a deep interest in conifers and played a leading part in the success of the 1931 Conifer Conference. Apart from horticulture, Lord Wakehurst, as Chairman of the Southern Railway, and as Member of Parliament for Brighton from 1889 to 1905, took a prominent part in public affairs. An indication of the multiplicity of his interest, well-known to his friends, was a large bundle of letters, memoranda, press-cuttings and such-like, held

together with an elastic band, which, to the dismay of his tailor, he habitually carried about with him in his pocket !

Like most really great gardeners, Lord Wakehurst was a free dispenser of his surplus plants. Kew has many times benefitted from his gifts, especially at the time of the establishment of the National Pinetum at Bedgebury. Indeed, generosity and kindness in all things to all men, were his outstanding characteristics.

W. J. BEAN.

LEONARD RODWAY.—We record with regret the death of Mr. Leonard Rodway, C.M.G., late Honorary Government Botanist, Tasmania, on March 9th 1936, after a long illness, at his home Melaleuka, Kingston, Tasmania.

Mr. L. Rodway was born at Torquay, England, in 1854 and after leaving school joined the naval training ship Worcester. From there he transferred to the merchant service but was forced by illness to relinquish this career. He went to live in Queensland and afterwards moved to Tasmania in 1880, where he practised as a dental surgeon. His interest in botany led him to join the Royal Society of Tasmania four years later. He carried on his botanical work in his spare time, sending his plants at first to Baron von Mueller at Melbourne for determination and later, after Mueller's death, working them out himself. During this period he gained an increasing knowledge of the plants of Tasmania which culminated in the publication of "The Tasmanian Flora" in 1903. Mr. Rodway also produced a popular handbook of the wild flowers of Tasmania. His botanical tastes were catholic, embracing cryptogams as well as phanerogams. In 1914 he published a volume dealing with the mosses of Tasmania ; this was to be followed by one on the hepatics, but for some reason this latter never materialised. In addition to these major works he was a regular contributor to the local scientific periodicals. Mr. Rodway held the post of Honorary Government Botanist for over 30 years and took a prominent part in most of the botanical activities of the country. To him, Tasmania owes almost entirely its Herbarium, which he had built up by his own unaided and devoted efforts during the many years he served without any salary as Government Botanist. The Herbarium, though consisting mainly of single specimens of each species, is very well preserved and all the specimens are well mounted, unlike most of those in other Australian Herbaria. In 1924 Mr. Rodway was awarded a medal by the Royal Society of Tasmania in recognition of his valuable work on the flora of the country. He retired from his official posts in 1932 as a result of failing health. His death is a sad loss to botanical science in Tasmania.

JOSEPH CLEMENS.—We regret to learn of the death, at the age of 73, of Chaplain Joseph Clemens from food poisoning in New Guinea on the 21st January, 1936. Formerly a Methodist Chaplain attached to the Army of the United States of America,

Mr. Clemens, after retirement and accompanied and assisted by his devoted wife, spent several years in arduous botanical collection in Cochin China, Borneo, the Philippine Islands and latterly in New Guinea. It was during an interval in plant hunting and when on the way to attend a conference at the German Lutheran Mission at Finschafen in New Guinea that Clemens contracted the disease to which he succumbed.

At an age when most people seek a well-earned rest this remarkable pair of enthusiastic plant collectors cheerfully faced exposure and hardship under conditions of considerable discomfort. They spent months on end in remote localities where little or no previous botanical research had been attempted so that their extensive gatherings have great scientific value. Sets of their collections from Borneo, including Mount Kinabalu, and from Indo-China, comprising over 8500 numbers, were acquired for the Herbarium.

**Regeneration of Vegetation in Arid South Australia.**—Few ecologists with a wide experience will deny that man is the most important acting agent in modifying vegetation. Apart from his introduction of crop plants, this activity has been destructive rather than constructive. It is becoming more and more realized that in many parts of the world the destruction of the natural climax communities results, often speedily, in further changes which cumulatively have great, sometimes drastic and nearly always harmful, effects on human economics. To discover how far such effects can be prevented, or how they can be remedied where they have occurred, is one of the chief problems of applied ecology.

In areas where the climatic or edaphic factors are of an extreme type and where, therefore, plant-life is on the border-line of existence, the effects of man's interference, especially through the introduction of flocks, herds, and pests, are often particularly obvious. Such an area is the arid region of South Australia, and a recently published ecological study\* of a restricted part of the North-East District is worthy of wide notice. The Koonamore Vegetation Reserve, an area of some 1,260 acres, was enclosed by rabbit- and sheep-proof fencing in July 1925. The Reserve is situated on an elevated peneplain surrounded by low hills of Pre-Cambrian strata from which the soils have been derived by erosion, flood deposition, and wind. The four main soil groups are those of the sandhills, sand-plains, silty flats, and shrub steppes. The average annual rainfall in the area is low (8-12 inches) and approximately only one-third of it is effective, the rest falling in such quantities as not to penetrate the soil. Both droughts and heavy storms are not infrequent and the latter often cause considerable erosion. Humidity shows great fluctuations but through every month, including the hot summer

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\*T. G. B. Osborn and T. B. Paltridge: On the climate and vegetation of the Koonamore Vegetation Reserve to 1931, in *Proc. Linn. Soc. N. S. Wales* 60, 392 (1935)

months, the air becomes almost saturated with water-vapour for a part of the day, a fact which, it is believed, accounts for the success of the saltbush through the district.

The area chosen for the Reserve at Koonamore was deliberately picked as being "the worst eaten-out portion of the paddock." The effect of heavy sheep-grazing upon the indigenous flora has led at times to complete extinction of the shrub-steppe community.

Permanent quadrats (100 m., 10 m., & 1 m. to a side) were charted and photographed at regular intervals. From the data already recorded it has been found that the principal factors affecting regeneration of the flora on the Reserve are erosion, due to removal of the perennial vegetation, temperature extremes, strong winds, low rainfall, heavy rainfall, and rabbits. Erosion has destroyed the seed-bed over a large part of the area, and the hard loamy soil, having lost its surface mulch, makes establishment of seedlings difficult. Accumulation of litter, fallen bushes, and blown soil all favour seedling establishment. It is somewhat surprising to learn that in this arid part of Australia there occur frosts and heavy rainfalls (3 inches or more in 24 hours) which not infrequently occasion considerable damage to the vegetation. The most aggressively harmful factor to the regeneration of woody plants has certainly been the rabbit. In one enclosure, a single rabbit in one night destroyed 18 one-year-old mulgas (*Acacia aneura*). As the authors conclude, "until some means of controlling the rabbit is discovered, all hope of regeneration of woody perennials is vain."

It is greatly to be hoped that the research so ably commenced at Koonamore will be continued by the same intensive methods of study as those which have already yielded such interesting and important results. Ecology is, and must long remain, an inductive science, and only intensive investigations combining the methods of comparative observation and experiment, and continued year after year, can lead to sound generalizations and give a basis for the treatment of practical problems.

W. B. TURRILL.

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**Gentians.\***—Though much has been written in recent years on the more popular gentian species and hybrids, little information has been available to the gardening public on the rarer and more recently introduced species. A comprehensive book on the genus was therefore much needed.

It is for the gardener, amateur and professional alike, that this book is written and it is noteworthy for the welcome absence of padding and "fine language," and for the skill by which technical terms, puzzling to non-botanists, are avoided. The arrangement of species is alphabetical and it would have been useful if the section

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\* By David Wilkie, Assistant Curator, Royal Botanic Gardens, Edinburgh. Illustrated from photographs, with a frontispiece by John Nash. Published by Country Life Ltd., London, Charles Scribner's Sons, New York, 1936. Pp. xii + 187. Price 12s. 6d.



to which each belongs had been given. Though the author states that it will not appeal to those only botanically interested in the genus, the descriptions are carefully drawn up and references given not only to the original description but also, wherever possible, to a figure of the plant. There are no keys for identification but in many cases a species rare in cultivation is contrasted with another allied and better-known species. The generic concept accepted is very wide, including not only all the sections of *Eugentiana* but of *Gentianella* as well. The accuracy of the botanical matter is on the whole praiseworthy, which should help materially to reduce the existing confusion in garden and nursery names. As an example one might quote the plant which has been grown as *Gentiana Purdomi* (and under other names) for years and is here determined as *G. gracilipes* Turrill.

The notes on the culture of each individual species are based on practical experience and will be of immense value to those who are attempting to establish species not previously grown. Propagation is dealt with separately: division and seed-raising have, of course, been the usual means of increasing stock, but the fact that cuttings of the rarer species can be struck will come as news to many and will open up new vistas to those who take a keen interest in raising their own plants.

Hybrids and hybridising are discussed in a practical manner and mention is made of the confusion resulting from indiscriminate crossing. This practice might have been more vigorously condemned, as determination of garden material in certain sections is already difficult and, in the course of a few years, is likely to be almost impossible.

The value of the book is greatly enhanced by the many excellent photographs reproduced. They are principally of living plants but a few are of original drawings and herbarium specimens: of the former, several are of plants growing in their native habitats photographed by the late George Forrest and other collectors. Some of the pictures, however, do not do the plants justice; this remark certainly applies to the coloured frontispiece of *Gentiana sino-ornata*.

In the list of "species not described in full," which contains nearly 700 names, together with notes on habit, colour and distribution, the great geographical range of the genus is strikingly emphasised.

This is a sound practical book and a welcome addition to the series which has been published in recent years dealing with individual genera.

**Welsh Timber Trees.\***—The need for a second edition of this very useful and instructive work on trees has enabled the author to amplify the information given on most of the subjects

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\* By H. A. Hyde, M.A., F.L.S. Published by the National Museum of Wales and by the Press Board of the University of Wales, 1935. Pp. 107, illustrations 49. Price 2s.

dealt with in the first edition in 1931, particularly in the citation of well-grown specimens and on timber utilisation. As in the first edition, he gives clear and concise descriptions of the native and better-known exotic trees growing in Wales, with illustrations of the habit, leafy shoots, flowers and seeds of many species. In all cases the descriptions are singularly free from technical terms, which makes the book particularly suitable for people who have little botanical knowledge, and for use as a teaching text-book not only in Wales but throughout the British Isles. The information given is accurate and to the point, and, moreover, the author has in most cases been careful to use the names that are correct according to the International Rules of Botanical Nomenclature; to save confusion he has included as synonyms well-known names that have had to give place to others that are less well known. In one or two instances he has not taken later homonyms into account, and has, for example, kept up *Larix Kaempferi* instead of *L. leptolepis*; but these are small matters in a book of such general excellence.

W. DALLIMORE.

**Raspberries and Kindred Fruits.\***—This publication deals with the history of the cultivated raspberry and includes lists and descriptions of the varieties usually cultivated in our gardens, full cultural details being given of the ordinary and perpetual fruiting varieties. The loganberry and the so-called hybrid berries are dealt with in the same way. Under each section the insect pests and diseases are adequately dealt with and the standard methods of control given. Why the Japanese wine berry, *Rubus phoenicolasius*, and the strawberry-raspberry, *Rubus illecebrosus*, should be included in the chapter dealing with hybrid berries is not apparent; both are good and distinct species, the former an excellent but neglected fruit, the latter only of ornamental value.

This book is produced in an attractive manner and should prove useful to the private and amateur gardener.

**Cherries and Soft Fruits.†**—This valuable publication includes all the papers read at the Fruit Conference held by the Royal Horticultural Society at the Greycoat Street Hall on July 16th and 17th, 1935.

From the following list it will be seen that the papers were all given by recognised experts and cover the entire field of hardy soft fruits as cultivated in Great Britain, including manuring, and the control of insect pests and fungoid diseases: — Cherries for Market-Growing Purposes (L. Doubleday), Cherries and their Varieties

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\* "Raspberries and Kindred Fruits; How to obtain fresh supplies daily from June till November, with chapters on the Loganberry, Hybrid Berries and Giant blackberries". By Ernest Markham, A.H.R.H.S. Macmillan & Co., Ltd., St. Martin's Street, London, 1936. Pp. 68, illustrated. Price 6s. net.

† 'Cherries and Soft Fruits: Varieties and Cultivation in 1935'. Report of the Conference held by the Royal Horticultural Society, July 1935. Edited for the Royal Horticultural Society by F. J. Chittenden, F.L.S., V.M.H. Pp. 164, figs. 19. Price 6s.

(E. A. Bunyard), *Growing Healthy Strawberries* (R. Vinson). *The Nutrition and Manuring of Soft Fruits* (Dr. T. Wallace), *Growing Healthy Raspberries—Control of Diseases and Pests* (R. V. Harris), *Soft Fruits for the Private Garden* (A. N. Rawes), *Blackberries, Hybrid Berries and Autumn-Fruiting Raspberries* (M. B. Crane), *Blackberries and Loganberries* (A.B. Beakbane), *Soft Fruits: Notes on Varieties Under Trial at Wisley* (A. N. Rawes), *Commercial Cultivation of the Gooseberry* (H. Selby), *Varieties and Quality of Fruits Required for Canning* (W. B. Adam), and *Bottling Soft Fruits at Home* (Miss E. M. Gunnell). The discussions following the papers are reprinted and together form perhaps the most valuable part of the book.

At its moderate price, this publication is excellent value and should be on the bookshelf of every commercial and private grower as a handy and reliable book of reference.

**American Ferns.\***—Books entirely devoted to the popular study of ferns are now comparatively rare, though fifty or sixty years ago they were much in vogue. The present work, though specifically designed for American readers, contains much that is of general interest to everyone interested in ferns. The treatment of the subject is somewhat unusual. Detailed instructions are given for propagating ferns from spores, accompanied by excellent photographic illustrations. An innovation is the ecological treatment of the species considered. These are grouped into a number of "associations," such as Oak-Hickory Association, Open Field, and so on, and stress is laid on the importance, when planting, of imitating natural conditions as closely as possible. Much useful information is given on the use of ferns in rock- and water-gardens, and designs are given for special fern-gardens.

Unfortunately the nomenclature is out-of-date, being that adopted by Asa Gray in his *Manual* of 1908. There can be no excuse for this, since Christensen's "Index Filicum" has been the standard work on fern names for the last thirty years.

There is a short glossary of technical terms at the end of the work in which one finds "lanceolate" defined as "several times as long as broad!" There are other errors also in the book, which tend to mar what is otherwise an attractive work. The photographic illustrations, of which there are many, are excellent, while the text is written throughout with an infectious enthusiasm. May it succeed in stimulating a new interest in a much-neglected group of plants!

F. BALLARD.

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\*"American Ferns: How to Know, Grow and Use Them." By Edith A. Roberts and Julia R. Lawrence. The Macmillan Co., New York, 1935. Pp. viii+98, 52 illustrations. Price 10s. 6d. net.

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# BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1936 ROYAL BOTANIC GARDENS, KEW

## XXXII—NOTES ON AFRICAN GRASSES: XIX\*

### Miscellaneous Notes and New Species.

C. E. Hubbard, H. G. Schweickerdt, and J. D. Snowden.

**Dignathia villosa** C. E. Hubbard, sp. nov.; a *D. ciliata* C. E. Hubbard, inflorescentiis densioribus villosa-hirsutis, ramis brevioribus, glumis ecarinatis dorso leviter convexis pilis densis usque ad 3 mm. longis obtectis differt.

*Gramen* perenne, usque ad 25 cm. altum. *Culmi* erecti, graciles, rigidi, teretes, simplices vel ramosi, multinodes. *Foliorum vaginæ* internodiis longiores, teretes, arcte appressæ, asperulæ, marginibus ciliatæ, ore villosa-barbatæ; ligulæ ad seriem ciliorum densorum redactæ, ciliis albis usque ad 3 mm. longis; laminæ lineares, basi leviter contractæ, apice tenuiter acutæ, usque ad 7 cm. longæ et 3 mm. latæ, planæ vel siccitate convolutæ vel involutæ, rigidulæ, glauco-virides, demum e vaginis disarticulantes, subtus laeves, supra asperulæ, glabræ vel pilis paucis longis sparsis præditæ. *Inflorescentia* spiciformis, densa, 3·5–4 cm. longa, circiter 1 cm. lata, pallida, dense villosa-hirsuta, basi in vaginis ampliatis inclusa; rhachis graciliuscula, glabra, angulata, angulis minute scaberulis; rami basi disarticulantes, dense villosa-hirsuti, parte nuda (pedunculo) circiter 1 mm. longa, spiculas 2–3 gerentes. *Spiculae fertiles* anguste ovatae, acutæ, 5 mm. longæ, lateraliter compressæ; rhachilla nonnunquam breviter producta. *Glumæ* subaequales vel superior inferiore paullo brevior, a latere visæ strictæ vel leviter curvatae, lineari-lanceolatae, subulatae, acutæ, rigidae, ecarinatae, dorso late cartilagineo-incrassatae leviter convexae pilis patentibus albidis usque ad 3 mm. longis e tuberculis ortis densissime villosa-hirsutæ, inferne marginibus angustissimis hyalinis. *Lemma* a latere visum semi-ovatum, acute acuminatum, 3·5 mm. longum, seta usque ad 1 mm. longa terminatum, carinata, carina inferne ciliolatum superne ciliatum, lateribus minute pubescens, 3-nerve, nervis lateralibus viridibus marginibus approximatis, membranaceum. *Palea* explanata lanceolata, acuta, 3–3·3 mm. longa, glabra. *Antherae* circiter 1 mm. longæ. *Caryopsis* 2 mm. longa. *Spicula sterilis* 3·5–4 mm. longa, ad glumas redacta, pedicellata, pedicello 1·5–2 mm. longo dense villosa-hirsuto. *Glumæ* apice leviter incurvae, ceterum spicularum fertilium glumis similes.

BRITISH SOMALILAND: without precise locality, *Godfrey Fausset*.

\*Continued from K.B. 1935,311.

**Saccolipsis africana** C. E. Hubbard et Snowden, sp. nov. ; affinis *S. interruptae* (Willd.) Stapf, sed spiculis minoribus oblongis vel elliptico-oblongis obtusis vel subacutis, gluma superiore et lemmate inferiore explanato obtusissimo, anthoecio supero elliptico spiculae fere aequilongo differt.

*Gramen* perenne, usque ad 1.5 m. altum, e rhizomate valido elongato repente ortum. *Culmi* erecti vel adscendentes, inferne plerumque validi et spongiosi, vel nonnunquam graciles, usque ad 8 mm. diametro, pauci- vel multi-nodes, simplices vel leviter ramosi, teretes, glabri, laeves. *Folia* glabra ; vaginae striatae, internodiis longiores vel superiores iis breviores, laxiusculae vel laxae, herbaceae, inferiores tenues, latae ; ligulae truncatae, 0.5–2 mm. longae, membranaceae ; laminae lineares, tenuiter acutae, 5–30 cm. vel ultra longae, 3–12 mm. latae, planae, plerumque flaccidae, virides, marginibus scabridis exceptis laeves vel superne nervis scabridae, costa media gracili. *Panicula* spiciformis, demum longe exserta, cylindrica, plerumque 6–30 cm. vel ultra longa, 5–8 mm. lata, densa ; rhachis validiuscula ; pedicelli 0.5–2 mm. longi. *Spiculae* oblongae vel elliptico-oblongae, subacutae vel obtusae, demum turgidulae, 2.5–3.2 (raro 3.5) mm. longae, 1–1.3 mm. latae, glabrae, plerumque virides, nonnunquam superne brunneolae vel purpurascens. *Gluma inferior* subrotunda, obtusissima, tertiam vel fere dimidiam partem spiculae aequans, subhyalina, 5–8-nervis ; gluma superior spiculae aequilonga, elliptico-oblonga, obtusissima, membranacea, prominenter 9-nervis. *Anthoecium inferum* sterile : lemma glumae superiori subsimile, 7–10-nerve ; palea hyalina, plus minusve redacta. *Anthoecium superum* ♂, ellipticum, acutum, 2.5–2.8 mm. longum, 1–1.2 mm. latum : lemma et palea demum crustacea ; antherae 1.5–2 mm. longae ; caryopsis late elliptica, circiter 1.5 mm. longa.

FRENCH GUINEA : Timbo, growing in water, *Pobéguin* 1740 ; neighbourhood of Kindia, *Jacques* 125.

FRENCH SUDAN : Gao, in the Niger, *Chevalier* 43048, 43120 ; Tenenkou, inundated grasslands, *Lean* 103.

SIERRA LEONE : Bumba, 210 m., *Thomas* 1944, 1991 ; Kabala, 400 m., *Thomas* 2110 ; Mamaha, *Thomas* 4508 ; Yombana, *Thomas* 4691 ; near Njala, in 1 m. of water, *Deighton* 1993 ; Mapaki, in swamp-rice field, *Deighton* 1315.

LIBERIA : Gbanga, in wet swale, *Linder* 521.

NORTHERN NIGERIA : Sokoto, in stream-beds and marshes, *Dalziel* 478 (type) ; Sokoto, *Moisier* 136a ; Naraguta, *Lely* 327 ; Argungu, in the Sokoto (Rima) River, grain eaten in times of scarcity, *Lamb* 101 ; Baga Seyoram, near Lake Chad, in 0.3 m. of water, *Gwynn* 109.

SOUTHERN NIGERIA : Opobo, *Jeffrys* 16 ; Lagos, *Rowland*.

ST. THOMAS ISLAND : Macambrara, 1100 m., *Moller* 134.

BELGIAN CONGO : Lower Congo, *Smith* ; Kitobola, *Vanderyst* 492 ; Kwango District, Bandundu, *Vanderyst* 4270.

ANGOLA : Cunene marshes, in fairly deep water, *Pearson* 2005, 2036.

ANGLO-EGYPTIAN SUDAN : Jur ; Ghattas' Seriba, *Schweinfurth* 2315 ; Lado, Yei River, side of Kagulu Khor, *Sillitoe* 5 ; Upper Nile Province, Tonga, *Brown* 1467 ; near Taufikiya, on right bank of R. Nile, *Simpson* 7452.

ABYSSINIA : Lake Tsana, south shore near Bahrdar Giyorgis, *Grabham*.

UGANDA : Entebbe, an aquatic, *Fyffe* 41 ; Mengo District. Namanyonyi, in grassy swamp, 1200 m., *Dummer* 2814 ; Budama District, in swamps, 1140 m., *Snowden* 1257.

NYASALAND : Karonga, *Whyte*.

NORTHERN RHODESIA : Mumbwa District, Lubali River, in swampy pans of the river-bed, 1080 m., *Adamson* in *Herb. Trapnell* 2572.

NATAL : Durban, *Wood* 3589 ; near Durban, in stagnant water, *Drège*.

This African species was included under *Saccolepis interrupta* (Willd.) Stapf (*Panicum interruptum* Willd.) by Stapf in Prain, Fl. Trop. Afr. 9, 757 (1920). The latter is, however, a distinct species, readily recognised by its larger usually acute spikelets and relatively shorter fertile florets. It is widely spread in the Indo-Malayan Region and extends into East Tropical Africa (Tanganyika Territory : Manyoni District : Kazikazi, in seasonal rain-ponds, 1260 m., *Burt* 2628).

The following three gatherings from West Tropical Africa have spikelets 3.5–4 mm. long and comparatively short false-spikes, but the shape and structure of the spikelets agree with those of *S. africana* :—Sierra Leone : Northern Province, Materboi, in swampy grassfields, *Glanville* 87 ; Bonthe Island, Tisana, edge of freshwater marsh, *Deighton* 2306. Northern Nigeria : Fodama, *Moisier* 224. They probably represent a distinct strain evolved from the above new species.

***Hyparrhenia dissoluta*** (Nees) C. E. Hubbard ex Hutch. in Hutch. & Dalz. Fl. W. Trop. Afr. 2, 591 (1936). *H. Ruprechtii* Fourn. Mex. Pl. 2, 67 (1886). *Anthistiria dissoluta* Nees ex Steud. Syn. Pl. Glum. 1, 400 (1854).

The type-specimen of *Anthistiria dissoluta* is in the Cambridge Herbarium. It was collected in Sierra Leone by Dr. Barry.

***Homozeugos Eylesii*** C. E. Hubbard, sp. nov. ; affine *H. huillensi* Stapf, sed foliis linearibus planis, nodis glabris, ligulis elongatis, spiculis longe pilosis differt.

*Gramen* perenne, 1–1.5 m. altum. *Culmi* erecti, teretes, rigidi, validiusculi, simplices, 3–4-nodes, laeves, prope inflorescentiam sparse pilosi vel omnino glabri. *Foliorum vaginæ* auriculatae, arcte appressae, laeves, glabrae vel appresse pubescentes, inferiores imbricatae, superiores internodiis breviores; ligulae anguste lanceolatae, auriculis adnatae, usque ad 3 cm. longae; laminae lineares, in acumen tenue longe attenuatae, usque ad 40 cm. (vel ultra) longae et 6 mm. latae, planae, firmae, glabrae vel appresse pubescentes, laeves vel scaberulae. *Racemi* 1–4, graciles, pallidi, villosi, 10–20 cm. longi, sessiles vel breviter pedunculati, tarde disarticulantes; rhacheos internodia gracillima, usque ad 10 mm. longa, dense ciliata, pilis albis usque ad 6 mm. longis; pedicelli internodiis similes, usque ad 7 mm. longi. *Spiculae* lineari-oblongae vel lineari-lanceolatae, 7–9 mm. longae (callo excluso); callus 1–2 mm. longus, subacutus, breviter barbatus. *Glumae* aequales; inferior explanata lanceolato-oblonga vel oblonga, truncata, coriacea, marginibus involutis, 7–9-nervis, molliter pilosa, pilis patulis albis usque 5 mm. longis; superior explanata anguste lanceolato-oblonga vel anguste oblonga, truncata, coriacea, 3-nervis, marginibus superne ciliolatis, dorso pubescens vel sparse pilosa. *Anthoecium inferum* sterile: lemma oblongum, truncatum, 6–7 mm. longum, tenuiter membranaceum, hyalinum, 2-nerve, marginibus pubescentibus; palea nulla. *Anthoecium superum* ♂: lemma oblongo-lineare, integrum, circiter 6 mm. longum, 3-nerve, superne ciliolatum; palea 1 mm. longa, hyalina; arista geniculata, gracillima, 2–3 cm. longa, columna pubescente 14–16 mm. longa; antherae 4 mm. longae; caryopsis oblanceolato-oblonga, 4 mm. longa.

NORTHERN RHODESIA: Mufulira, in open forest, May 1934, Eyles 8369 (type), 8371.

***Diheteropogon maximus*** C. E. Hubbard, sp. nov.; affinis *D. grandifloro* (Hack.) Stapf et *D. Buchneri* (Hack.) Stapf, culmis validioribus altioribus superne ramosis, foliorum laminis latioribus, racemis longioribus, spiculis pedicellatis majoribus differt.

*Gramen* perenne, compacte caespitosum, usque ad 2 m. altum. *Culmi* erecti, validi, teretes, circiter 7 mm. diametro, 6-nodes, superne ramosi, apice ramulorum inflorescentias gerentes, glabri, laeves, prope nodos pruinosi. *Foliorum vaginæ* demum internodiis breviores, glabrae, laeves, striatae; ligulae truncatae, usque ad 2 mm. longae, scariosae, glabrae; laminae lineares, tenuiter acutae, usque ad 55 cm. longae, 10–16 mm. latae, planae, firmae, virides, pone ligulam pilis longis exceptis glabrae, marginibus scaberulae, ceterum laeves. *Racemi* validi, usque ad 18 cm. longi et 15 mm. lati, erecti, approximati, unus sessilis, alter breviter pedunculatus; spicularum paria homogama 3–6; rhacheos internodia inter paria heterogama linearia, circiter 8 mm. longa, marginibus dense molliter ciliata, superne dorso convexa, apice excavata bidentata vel emarginata, inter paria homogama subsimilia sed glabra nec apice

296

excavata; pedicelli internodiis adjacentibus similis sed magis applanati. *Spiculae sessiles fertiles* lineari-oblongae, 8–10 mm. longae (callo excluso), apicem versus attenuatae, stramineae; callus pungens, 4 mm. longus, pilis albis sericeis dense barbatus. *Gluma inferior* glabra, laevis, 2-nervis, inter carinas crassas obtusas late sulcata, marginibus tenuibus et apice hyalino exceptis coriacea; superior dorso convexa, prope apicem carinata, 1-nervis. *Anthoecium inferum*: lemma obovato-oblongum, rotundato-obtusum, 7 mm. longum, tenuissime 2-nerve, hyalinum, marginibus pilis debilibus ciliatum. *Anthoecium superum* ♀: lemma lineari-oblongum, 6 mm. longum, breviter bilobum, lobis obtusis ciliolatis, marginibus hyalinis; arista usque ad 13 cm. longa, fulva, columna laxa torta dense et breviter pilosa, seta scabrida; palea elliptica, obtusa, 3.5 mm. longa, hyalina, 2-nervis, ciliolata; antherae 5–6 mm. longae. *Spiculae sessiles masculae vel steriles* 12–15 mm. longae; antherae usque ad 10 mm. longae. *Spiculae pedicellatae* ♂, anguste elliptico-oblongae, acutae, 2.3–2.7 cm. longae, 7 mm. latae, virides vel purpureo-suffusae. *Gluma inferior* nervis valde approximatis praedita, intus puberula, extra glabra, laevis, alis scariosis exceptis chartacea, ala latiore superne usque ad 2 mm. lata; gluma superior explanata anguste oblonga, acuta, tenuiter 3-nervis, marginibus ciliata. *Anthoecium inferum*: lemma anguste oblongum, obtusum, usque ad 20 mm. longum, 3-nerve, marginibus pilis debilibus ciliatum. *Anthoecium superum* ♂: lemma anguste oblongum, obtusum vel breviter bilobum et mucronulatum, usque ad 14 mm. longum, 1-nerve, marginibus laxa ciliolatum; palea lineari-oblonga, 6 mm. longa, glabra; antherae 12–14 mm. longae.

ANGOLA: Malange Plateau; Kirima, near the Rivers Jombo and Luando, 1000 m., Feb. 1931, Gossweiler 9497.

***Brachiaria humidicola* (Rendle) Schweickerdt, comb. nov.** *Panicum humidicolum* Rendle in Cat. Welw. Afr. Pl. 2, 169 (1899) et in Journ. Linn. Soc., Bot. 40, 229 (1911). *Brachiaria dictyoneura* Stapf in Prain, Fl. Trop. Afr. 9, 512 (1919), pro parte; Stent & Rattray in Proc. Rhod. Sc. Assoc. 32, 22 (1933); Arnold in Rhod. Agric. Journ. 33, 4, 236 (1936); Hutchinson & Dalziel, Fl. West Trop. Afr. 2, 2, 563 (1936).

***Panicum humidicolum*** Rendle was considered by Stapf to be conspecific with *Panicum dictyoneurum* Fig. et De Not. and on transference of the latter species to the genus *Brachiaria* Gris., Rendle's species was placed by him under *Brachiaria dictyoneura* (Fig. et de Not.) Stapf in Prain, Fl. Trop. Afr. Additional material accumulated in the Kew Herbarium since the publication of that volume has shown on critical examination that part of this resembled *Panicum humidicolum* Rendle, i.e. *B. humidicola* (Rendle) Schweickerdt, a species deserving independent specific rank.



As these two species are very closely allied, their main distinguishing characters may be tabulated as follows :—

*B. dictyoneura*

1. A densely caespitose perennial ; stolons always absent ; culms often geniculately ascending but never taking root at the nodes.
2. Panicle usually consisting of 4 to many racemes.
3. Spikelets up to 7 mm. long, but usually somewhat smaller, narrowly-elliptic to elliptic in outline.
4. Upper glume usually 7-9-nerved.
5. Lemma of the upper floret 3-3.5 mm. long and  $\pm$  1.5 mm. wide, with a well developed apiculus, usually slightly yellowish in colour when mature.

The relatively more slender and shorter upper lemma in comparison to the length of the glumes and lower lemma accounts for the more elongated and tapering appearance of the whole spikelet.

*B. humidicola*

A creeping perennial giving rise to a number of stolons from which the culms arise at intervals ; culms usually geniculately ascending, often rooting at the nodes.

Panicle usually consisting of 3-4 racemes, rarely more.

Spikelets up to 5 mm. long, but usually somewhat smaller, elliptic to broadly-elliptic in outline.

Upper glume usually 5-7-nerved.

Lemma of the upper floret 3.5-4 mm. long and 2 mm. wide, with an inconspicuous apiculus, usually pure white in the mature condition.

The large lemma in comparison to the size of the glumes and lower lemma gives the spikelets a more rounded, turgid and blunt appearance.

Owing to the close resemblance of the above species, they have been somewhat confused as may be seen from the synonymy cited above.

Their geographic distribution is somewhat different ; whereas *B. dictyoneura* appears to be limited to North Central—and North Eastern Tropical Africa, *B. humidicola* ranges from Northern Nigeria through Angola to Tanganyika Territory, the Rhodesias, Portuguese East Africa and finally reaches the subtropical parts of the Eastern Transvaal. It is only in Tanganyika Territory that these species overlap.

The following is a rearrangement of the material in the Herbaria at Kew and the British Museum in accordance with the above conception of these species.

1. *Brachiaria dictyoneura* (Fig. et De Not.) Stapf.

SOUTHERN ABYSSINIA : without precise locality, *Stordy*.

KENYA COLONY : Nairobi, Sept., *Hitchcock* 24516. May, *Linton*.

3. Jan., *Napier* 857. Sept., *Dowson* 230. Kitui, *Hildebrandt* 2663.

TANGANYIKA TERRITORY: Kondoa Irangi Distr.; near Kolo, Jan., *Burt* 1276. near Sambola, May, *Burt* 2620. *Phillips* in Nat. Herb. Pret. 15709, 15710. at Hundwe, Jan., *Burt* 1534. *Burt & Phillips* 1093. near Mangoloma Febr., *Burt* 1567. Massai-Steppe, *Merker* s.n. Usambara, Bonda, *Holst* 4015. Without precise locality, *Hannington*, s.n.

Through the courtesy of Prof. Dr. R. Pilger, Berlin, who kindly sent me fragments of the type of *Panicum albobellereum* K. Schum., it was possible to identify this species as *Brachiaria dictyoneura* (Fig. et De Not.) Stapf.

## 2. *Brachiaria humidicola* (Rendle) Schweickerdt.

NORTHERN NIGERIA: Naraguta, Bauchi Plateau, July, *Lely* P. 405.

ANGOLA: Huilla, *Welwitsch* 2678.

TANGANYIKA TERRITORY: Bukoba, July, *Haarer* 205. Iringa, Febr. *Lynes*, l.g. 146.

NORTHERN RHODESIA: Kafue Flats, Mazabuka, Jan.-Febr., *Trapnell* 841, 862, 868.

SOUTHERN RHODESIA: Salisbury, Jan., *Eyles* 588, 2932. *Trapnell* 751. *Mundy* 42, and in *South. Rhod. Govt. Herb.* 2825.

PORT. EAST AFRICA: open woods at Beira, *Swynnerton* 1596b.

TRANSVAAL: Nelspruit, June, *Liebenberg* 3501. Cultivated at Prinshof Expt. Station, Pretoria, *Nat. Herb.* 8022.

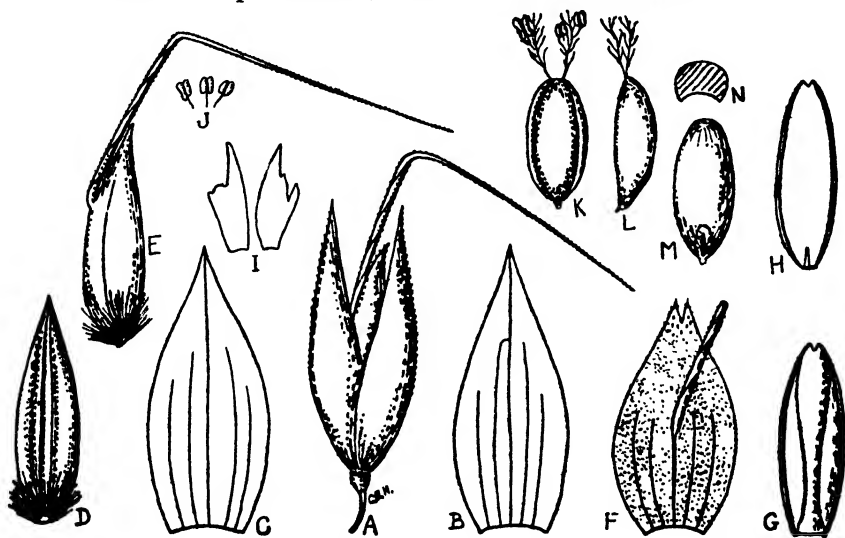


Fig. 1. *Hypseochloa cameroonensis* C. E. Hubbard. A, spikelet,  $\times 12$ ; B, lower glume, flattened,  $\times 12$ ; C, upper glume, flattened,  $\times 12$ ; D, floret, from the front,  $\times 12$ ; E, floret, with awn,  $\times 12$ ; F, lemma, flattened,  $\times 12$ ; G, palea,  $\times 12$ ; H, palea from back, to show prolongation of rhachilla,  $\times 12$ ; I, lodicules,  $\times 14$ ; J, stamens,  $\times 10$ ; K, L, M, caryopsis,  $\times 14$ ; N, transverse section of caryopsis.

## A New Genus from the Cameroons Mountain.

C. E. Hubbard.

**Hypseochloa** C. E. Hubbard ; genus novum cum *Agrostes* L. et *Aira* L. comparandum ; ab illa glumis 5- (raro superiore 3-) nervibus, lemmate acute et breviter bifido demum indurato et crustaceo marginibus rigide involutis, palea prominenter bicarinata carinis angustissime alatis ; ab hac spiculis unifloris, glumis 5-(raro superiore 3-) nervibus differt.

*Spiculae* anguste ellipticae vel anguste oblongae, demum hiantes, lateraliter compressae, aristatae, in paniculam laxam pedicellatae ; rhachilla supra glumas et infra anthoecium disarticulans, ut acumen minutum glabrum supra anthoecium producta. *Anthoecium* 1, ♀, glumis paullo brevius. *Glumae* persistentes, aequales, similes, a latere visae lanceolatae, acuminatae, tenuiter acutae, nonnunquam mucronatae, basin versus dorso rotundatae, superne carinatae, firme membranaceae, marginibus hyalinis, demum tenuiter chartaceae, glabrae, quinquenerves (vel superior trinervis). *Lemma* a latere visum oblongum, oblique acuminatum, acutum, dorso rotundatum, marginibus involutis approximatis parallelis, demum rigidum et induratum, crustaceum, tenuiter quinquenerve, glabrum, apice breviter et acute bifidum, dorso supra medium aristatum ; callus minutus, rotundato-obtusius, breviter barbatus ; arista geniculata, scaberula, columna torta. *Palea* oblonga, minute bifida, lemmate paullo brevior, hyalino-membranacea, bicarinata, carinis angustissime alatis, inter carinas leviter concava. *Lodiculae* duae, lanceolatae, hyalinae. *Stamina* tria ; antherae ellipticae. *Ovarium* glabrum ; styli terminales ; stigmata pilis sparsis plumosa. *Caryopsis* oblonga, dorso rotundata, facie leviter concava, inter lemma paleamque arcte inclusa ; hilum basale ; embryo parva.

*Gramen* annuum ; culmi gracillimi, paucinodes ; foliorum laminae angustissimae ; ligulae hyalinae ; panicula terminalis ; rami trichotomo-divisi.

Species 1, Africae occidentalis incola.

**Hypseochloa cameroonensis** C. E. Hubbard sp. nov. *Culmi* fasciculati, erecti vel leviter geniculati, usque ad 30 cm. alti, simplices vel prope basin ramosi, 2-3-nodes, glabri laevesque ; internodia superiora demum exserta. *Folia* glabra ; vaginae angustae, tenuiter striatae, laeves ; ligulae oblongae, 2-5 mm. longae ; laminae anguste lineares, acutae, 2.5-9 cm. longae, usque ad 1 mm. latae, planae vel siccitate convolutae, tenues, tenuiter et arcte nervatae, minute asperulae. *Panicula* ovata, laxa, 3.8-9 cm. longa, 1.2-3.8 cm. lata ; rhachis gracillima, laevis ; rami bini, basin versus nudati et simplices, supra trichotomo-divisi, flexuosi, glabri, laeves ; pedicelli capillares, laeves, inaequales, 2-5 mm. longi, apice leviter incrassati. *Spiculae* 3 mm. longae, pallide virides vel purpurascens. *Glumae* carinis superne scaberulae. *Lemma* 2-2.5 mm. longum, minute asperulum ; callus pilis albis usque ad 1 mm. longis barbatus ;

arista 4-6 mm. longa, medio geniculata, seta divaricata. *Palea* usque ad 2 mm. longa. *Lodiculae* fere 1 mm. longae. *Antherae* 0.2-0.3 mm. longae. *Caryopsis* 1.3 mm. longa.

SOUTHERN NIGERIA: Cameroons Mtn., in grassland, 2250 m., *Maitland* 874; above Buea, frequent between tufts of high grasses in grassland, 2790 m., *Mildbraed* 10881 (type); amongst rocks and boulders, 3600 m., *Maitland* 1274A.

The spikelets are cleistogamous, the minute anthers being enclosed in the mature florets and entangled in the hairs of the stigmas.

*Hypseochloa* occupies a somewhat intermediate position between *Agrostis* L. (*Agrostaeae*) and *Aira* L. (*Aveneae*). The former genus may be distinguished by its 1-3-nerved glumes, and thin often hyaline more or less truncate lemma which does not become indurated at maturity. The solitary florets are remarkably similar to those of *Aira caryophylla* L. and were it not for the different glumes it might be considered a reduced *Aira*.

### New Species of *Agrostis* from Tropical Africa.

C. E. Hubbard.

*Agrostis congesta* C. E. Hubbard, sp. nov.; ab *A. Schimperiana* Hochst., spiculis majoribus, lemmate prope basin aristato, arista usque ad 5 mm. longa distinguenda.

*Gramen* perenne, usque ad 90 cm. altum. *Culmi* erecti vel geniculato-adscendentes, graciles, simplices, 2-3-nodes, glabri, tenuiter scaberuli, internodio summo demum longe exserto. *Foliorum vaginæ* striatae, glabrae, tenuiter scaberulae, internodiis tandem breviores; ligulae oblongae, demum laceratae, usque ad 4 mm. longae, dorso asperulae; laminae anguste lineares, usque ad 30 cm. longae et 3 mm. latae, planae vel convolutae, virides, glabrae, nervosae, scaberulae. *Panicula* contracta, densa, spiciformis, erecta, usque ad 16 cm. longa et 1.2 cm. lata; rhachis scaberula; rami plerumque bini, erecti, filiformes, scaberuli, inferiores usque ad 7.5 cm. longi, prope basin per 0.4-3 cm. nudati, supra dense spiculati; pedicelli laterales brevissimi. *Spiculae* anguste oblongae, 4.4-5 mm. longae, virides vel purpureo-tinctae; rhachilla minute producta, glabra. *Glumae* subaequales vel superior paullo brevior, acutae, membranaceae, carinis superne scaberulae; inferior ambitu anguste lanceolata, 3-nervis, nervis lateralibus brevibus; superior lanceolato-linearis, 1-nervis. *Lemma* explanatum ovato-oblongum, truncatum, circiter 3 mm. longum, hyalino-membranaceum, glabrum, asperulum, 5-nervis, nervis lateralibus breviter excurrentibus; arista prope basin lemmatis orta, leviter geniculata, usque ad 5 mm. longa, columna usque ad 3 mm. longa; callus sparse et breviter barbatus. *Palea* oblongo-lanceolata, 2 mm. longa, tenuiter 2-nervis. *Caryopsis* 2 mm. longa.

SOUTHERN NIGERIA: Cameroons Mtn., 2400-3000 m., *Mann* 2086 (type); 2280 m., in grassland, *Maitland* 1034.

**Agrostis Whytei** C. E. Hubbard, sp. nov.; affinis *A. keniensi* Pilger, sed panícula contracta angusta, spiculis densiusculis, rhachilla glabra, lemmate et palea brevior differt.

*Gramen* perenne (?), parte basali ignota. *Culmi* paniculam versus minute asperuli. *Folia* superiora glabra, viridia; vaginae elongatae, striatae, laeves; ligulae oblongae, usque ad 5 mm. longae, scariosae; laminae lineares, tenuiter acutae, usque ad 20 cm. longae, 3-4 mm. latae, planae, firmae, arcte nervosae, nervis scaberulis. *Panicula* elongata, angusta, 20-35 cm. longa, 1.8-3.8 cm. lata, contracta, interrupta, densiuscula, leviter flexuosa; rhachis graciliuscula, inferne laevis, superne scaberula; rami fasciculati, inaequales, filiformes, scaberuli, longiores basin versus per 6 cm. nudati et simplices, superne crebre divisi, breviores prope basin ramosi, inferiores usque ad 13.8 cm. longi; pedicelli laterales spiculis breviores. *Spiculae* 4 mm. longae, late hiantes, purpureae vel virides; rhachilla glabra, minutissime producta. *Glumae* a latere visae lineari-lanceolatae, acutae, firme membranaceae, carinis scaberulae, lateribus leviter scaberulae; inferior 1-nervis; superior inferiore paulo brevior, 1-sub3-nervis. *Lemma* explanatum ovato-oblongum, truncatum, 2.5-2.7 mm. longum, membranaceum, 5-nerve, nervis lateralibus breviter excurrentibus, nervis laxe et breviter pilosum; callus breviter barbatus; arista e medio lemmatis orta, geniculata, usque ad 4 mm. longa, columna 1.5 mm. longa. *Palea* 0.7-1.5 mm. longa, oblonga, tenuissime 2-nervis. *Antherae* 1 mm. longae.

NYASALAND: Mt. Zomba, 1300-2000 m., *Whyte*.

This species is also related to *Agrostis continuata* Stapf, but may be distinguished by the longer looser panicle, longer-bearded callus, and the insertion of the awn at the middle of the valve.

**Agrostis Pilgeriana** C. E. Hubbard, sp. nov.; ab *A. Schimperiana* Hochst., panícula laxa latiore, lemmate pubescente e medio aristato, arista 3.5-4 mm. longa distinguenda.

*Gramen* perenne, usque ad 70 cm. altum. *Culmi* basi prostrata geniculato-adscendentes, gracillimi, simplices vel e nodis inferioribus ramosi, 7-nodes, prope paniculam leviter scaberuli, ceterum glabri laevesque; internodia superiora exserta. *Folia* glabra; vaginae tenuiter striatae, asperulae vel laeves; ligulae oblongae, truncatae, 4 mm. longae, scariosae; laminae lineares, tenuiter acutae, usque ad 10 cm. (vel ultra) longae, 1-3 mm. latae, planae, tenuiter scaberulae vel laeves. *Panicula* laxa, ovato-oblonga, usque ad 10 cm. longa et 3 cm. lata, flexuosa; rhachis filiformis, superne scaberula; rami 2-3-nati, tenuiter filiformes, flexuosi, prope basin per 0.6-1.8 cm. nudati, superne densiuscule spiculati, scaberuli, inferiores usque ad 3.7 cm. longi; pedicelli laterales 0.6-2 mm. longi, terminales longiores. *Spiculae* anguste ellipticae, demum hiantes, 3 mm. longae, purpureae; rhachilla minutissime producta. *Glumae* subaequales, a latere visae anguste lanceolatae et tenuiter acutae, membranaceae, 3-nerves, nervis lateralibus brevibus, carinis

scabrido-ciliolatae, lateribus sparse scabridae. *Lemma* explanatum late elliptico-oblongum, truncatum, denticulatum, fere 2 mm. longum, tenuiter membranaceum, 5-nerve, nervis lateralibus breviter excurrentibus, parte tertia superiore excepta tenuiter pubescens; arista prope medium lemmatis orta, recta, 3.5–4 mm. longa, columna 1 mm. longa; callus brevissime barbatus. *Palea* anguste oblonga, lemmati fere aequilonga, nervis minute excurrentibus. *Antherae* 0.6 mm. longae.

KENYA COLONY: Mount Kenya, upper Bamboo region, 2800 m., *Fries* 1342.

***Agrostis isopholis* C. E. Hubbard**, sp. nov.; ab *A. Pilgeriana* C. E. Hubbard, culmis 3–4-nodibus suberectis, laminis angustioribus, panícula anguste oblonga, spiculis minoribus, palea lemmati subaequilonga, arista breviorē distinguenda.

*Gramen* perenne, usque ad 45 cm. altum. *Culmi* e basi geniculata erecti, graciles, simplices, vel e nodis inferioribus ramosi, 3–4-nodes, glabri laevesque; internodia summa tandem longe exserta. *Folia* glabra; vaginae internodiis inferioribus longiores, laeves; ligulae oblongae, rotundato-obtusae, 2–3 mm. longae, scariosae; laminae anguste lineares, in acumen tenue attenuatae, usque ad 10 cm. longae, 1–1.5 mm. latae, planae vel involutae, rigidiusculae, laeves vel supra et marginibus tenuiter scaberulae. *Panicula* anguste oblonga, 7.5–16 cm. longa, usque ad 2.5 cm. lata, erecta, laxa; rhachis gracillima, laevis; rami fasciculati, tenuiter filiformes vel capillares, flexuosi, prope basin per 1–3 cm. nudati, superne laxē divisi, laeves, inferiores usque ad 6 cm. longi; pedicelli laterales 2–4 mm. longi, terminales longiores. *Spiculae* anguste ellipticae vel oblongae, demum hiantes, 2.6–3 mm. longae, purpureae; rhachilla usque ad 0.5 mm. producta, pubescens. *Glumae* aequales vel subaequales, lanceolatae, acutae, membranaceae, carinis superne sparse scabrido-ciliolatae, 3-nerves, nervis lateralibus brevibus. *Lemma* explanatum late ovato-oblongum, anguste truncatum, glumis aequilongum vel paullo brevius, tenuiter membranaceum, 5-nerve, nervis lateralibus breviter excurrentibus, parte tertia superiore excepta pilis patulis brevibus laxē pilosum, asperulum; arista prope medium lemmatis orta, tenuissima, recta, 1–2.5 mm. longa; callus breviter barbatus. *Palea* oblonga, obtusa, 1.5 mm. longa, hyalina, tenuissime 2-nervis. *Antherae* 1 mm. longae.

BELGIAN CONGO: Virunga Mtns.; Mt. Karisimbi, from great swamp on north plateau, 3000 m., *Burti* 3090.

***Agrostis sororia* C. E. Hubbard**, sp. nov.; affinis *A. Mannii* Stapf, sed glumis inaequalibus, gluma inferiore acuminata, lemmate late ovato, culmis laevibus differt.

*Gramen* perenne, usque ad 75 cm. altum. *Culmi* erecti vel geniculato-adscendentes, nonnunquam basi prostrati et e nodis radicantes, modice graciles, simplices, 3–7-nodes, glabri, laeves. *Folia* glabra; vaginae striatae, internodiis breviores vel longiores,

laeves vel retrorse scaberulae ; ligulae oblongae, usque ad 7 mm. longae, scariosae ; laminae lineares, in acumen tenue attenuatae, usque ad 20 cm. longae, 2.5–5 mm. latae, planae, firmae, nervosae, scaberulae, vel subtus laeves. *Panicula* laxa, flexuosa, usque ad 23 cm. longa et 6 cm. lata ; rhachis laevis, vel superne scaberula ; rami filiformes, sparse vel dense scaberuli, basi per 1.5–7.5 cm. nudati, superne laxe divisi, inferiores fasciculati, usque ad 12.5 cm. longi ; pedicelli laterales 1–3 mm. longi. *Spiculae* late hiantes, 3.5–4.5 mm. longae, virides vel purpurascens ; rhachilla in acumen pilosum usque ad 1 mm. producta, nonnunquam setam tenuissimam usque ad 3 mm. longam gerens. *Glumae* membranaceae, 1–3-nerves, nervis lateralibus brevibus ; inferior a latere visa anguste lanceolata, tenuiter acuta, carina superne scaberula, apice saepe leviter recurvata ; superior minus acuta, circiter tres partes inferioris aequans, carina laevis vel prope apicem leviter scaberula. *Lemma* explanatum late oblongum, anguste truncatum vel leviter bifidum, 2–2.5 mm. longum, laxe et breviter pilosum, 5-nerve, nervis lateralibus excurrentibus extimis in mucrones usque ad 1 mm. longos productis ; arista prope basin lemmatis orta, geniculata, usque ad 7.5 mm. longa, columna usque ad 2.5 mm. longa ; callus barbatus. Palea lanceolata, lemmati subaequilonga, nervis breviter excurrentibus. *Antherae* 1.2–1.5 mm. longae.

UGANDA : Mt. Elgon, Bamboo zone, *Liebenberg* 1691 ; Mt. Ruwenzori, 3000 m., *Oliver* 16 (type).

Closely related to *A. Mannii* (Hook. f.) Stapf, which has subequal and similar glumes, the lower glume not recurved at the tip, and elliptic-oblong truncate lemmas.

***Agrostis tricholemma*** C. E. Hubbard, sp. nov. ; *A. Mannii* Stapf affinis, culmis laevibus, glumis oblongo-lanceolatis 1-nervibus, rhachilla haud producta, arista brevior, nervis lemmatis non excurrentibus differt.

*Gramen* perenne, caespitosum, usque ad 90 cm. altum. *Culmi* erecti vel basi geniculati, graciles, simplices, 3–4-nodes, glabri, laeves. *Foliorum vaginae* internodiis tandem breviores, tenuiter striatae, glabrae, laeves ; ligulae oblongae, usque ad 2 mm. longae, membranaceae, demum laceratae ; laminae anguste lineares, in acumen tenue attenuatae, usque ad 15 cm. longae et 3 mm. latae, planae, firmae, glabrae, laeves vel minute scaberulae. *Panicula* angusta, contracta, 12.5–25 cm. longa, 1.2–2.5 cm. lata, flexuosa, nutans ; rhachis inferne laevis, superne leviter scaberula ; rami 2–4-nati, distantes, inaequales, filiformes, flexuosi, erecti vel adscendentes, scaberuli, longiores basi per 2–3.5 cm. nudati, inferiores usque ad 10 cm. longi ; pedicelli 1–5 mm. longi. *Spiculae* oblongae, demum leviter hiantes, 3.5–4 mm. longae, pallide virides vel purpureo-tinctae ; rhachilla haud producta. *Glumae* anguste-oblongo-lanceolatae, acutae, firme membranaceae, subaequales, 1-nerves, carinis scaberulae, lateribus sparse asperulae. *Lemma* explanatum oblongo-ovatum, truncatum, 2.5–2.8 mm. longum,

tenuiter membranaceum, apice minute ciliolatum, prope apicem exceptum appresse pilosum, 5-nerve, nervis lateralibus minute excurrentibus; arista triente inferiore lemmatis orta, leviter geniculata, 3 mm. longa; callus breviter barbatus. *Palea* lanceolato-oblonga, obtusa, usque ad 2.5 mm. longa, inter nervos sparse pubescens. *Antherae* 1.5 mm. longae, apicibus apiculatis.

TANGANYIKA TERRITORY: Iringa Province; Msima Stock Farm, in vleis, *Emson* 359.

***Agrostis Burttil*** C. E. Hubbard, sp. nov.; affinis *A. kilimandscharicae* Mez, sed panícula densiore, culmis validiusculis 4-5-nodibus, lemmate pilis longis villosa differt.

*Gramen* perenne, usque ad 60 cm. altum. *Culmi* erecti vel suberecti, validiusculi, 4-5-nodes, internodiis inferioribus brevibus, e nodis inferioribus ramosi, glabri, laeves. *Folia* glabra; vaginae internodiis longiores, latae, laxiusculae, striatae, laeves; ligulae oblongae, truncatae, usque ad 5 mm. longae, scariosae; laminae lineares, in acumen tenue attenuatae, usque ad 18 cm. longae, 3-5 mm. latae, planae, erectae, rigidiusculae, virides, nervosae, supra nervis scaberulae, subtus laeves. *Panicula* contracta, densiuscula, usque ad 23 cm. longa et 6 cm. lata, flexuosa; rhachis laevis vel fere laevis; rami 2-3-nati, flexuosi, filiformes, scaberuli, basi nudati, superne divisi et dense spiculati, inferiores usque ad 12.5 cm. longi; pedicelli laterales usque ad 2 mm. longi, terminales longiores. *Spiculae* late hiantes, 3 mm. longae, pallide virides vel pallide purpureae; rhachilla basi pilosa, in setam tenuissimam usque ad 3 mm. producta. *Glumae* subaequales vel superior inferiore paullo brevior, a latere visae anguste lanceolatae, acutae, membranaceae, 1-nerves, carinis scaberulae vel gluma superior fere laevis. *Lemma* explanatum ovatum, truncatum, 2-2.5 mm. longum, tenuiter membranaceum, pilis longis tenuissimis villosum, 5-nerve, nervis lateralibus excurrentibus extimis in mucrones usque ad 1 mm. longos productis; arista prope basin lemmatis orta, usque ad 7 mm. longa, leviter geniculata, columna circiter 2 mm. longa; callus breviter barbatus. *Palea* anguste lanceolata, 2-2.4 mm. longa, nervis breviter excurrentibus. *Antherae* 1 mm. longae.

BELGIAN CONGO: Virunga Mtns.; Mt. Ninagongo, dominating new lava and in ravines intersecting central active cone, 3150-3300 m., *Burttil* 3176.

***Agrostis Friesiorum*** C. E. Hubbard, sp. nov.; ab *A. kilimandscharica* Mez, culmis caespitosis erectis vel suberectis prope basin 3-nodibus, spiculis paullo minoribus, glumis leviter inaequalibus, antheris minoribus distinguenda.

*Gramen* perenne caespitosum, usque ad 70 cm. altum. *Culmi* erecti vel suberecti, graciles, simplices vel e nodis ramosi, basin versus circiter 3-nodes, internodiis inferioribus brevibus, internodio summo elongato demum longe exserto. *Folia* glabra; vaginae imbricatae, striatae, laeves vel leviter asperulae; ligulae oblongae,



truncatae, 2–4 mm. longae, scariosae; laminae lineares, in acumen obtusum attenuatae, usque ad 25 cm. longae, 2–3·5 mm. latae, planae, firmae, nervosae, tenuiter scaberulae. *Panicula* ovata, demum laxa et aperta, usque ad 23 cm. longa et 18 cm. lata; rhachis inferne laevis, superne leviter scaberula; rami semi-verticillati vel superne bini, tenuiter filiformes, patentes, apicem versus leviter scaberuli, inferiores usque ad 11 cm. longi, basi per 1·5–5 cm. nudati, superne laxe divisi; pedicelli laterales 0·5–3 mm. longi. *Spiculae* hiantes, 2·6–3 mm. longae, purpurascens; rhachilla plerumque minutissima producta, pubescens, raro usque ad 1 mm. longa. *Glumae* a latere visae anguste lanceolatae et acutae, membranaceae, 1–3-nerves, nervis lateralibus brevibus, carinis superne scaberulae vel gluma superior fere laevis; superior inferiore paullo brevior. *Lemma* explanatum late ovato-oblongum, truncatum, 1·8–2 mm. longum, hyalino-membranaceum, parte tertia superiore excepta laxe pubescens, 5-nerve, nervis lateralibus breviter excurrentibus; arista prope basin lemmatis orta, geniculata, 3–5 mm. longa, columna 1·5–2 mm. longa; callus breviter barbatus. *Palea* lanceolato-oblonga, lemmati subaequilonga, tenuiter 2-nervis. *Antherae* 0·5–0·7 mm. longae. *Caryopsis* 1·3 mm. longa.

KENYA COLONY: Mt. Kenya, lower Bamboo region, *Fries* 1200 (type); open spaces in Bamboo forest, 3000–3300 m., *Lyne Watt* 1128.

***Agrostis leioclada* C. E. Hubbard**, sp. nov.; *A. Friesiorum* C. E. Hubbard affinis, panicula anguste oblonga contracta, ramis laevibus adscendentibus, spiculis et antheris majoribus differt.

*Gramen* perenne, usque ad 60 cm. altum. *Culmi* erecti, graciles, simplices, basin versus 3–4-nodes, glabri, laeves, internodio summo demum exserto. *Folia* glabra; vaginae tenuiter striatae, laeves, imbricatae, inferiores demum in fibros fissae; ligulae oblongae, scariosae, 4–6 mm. longae, laceratae; laminae anguste lineares, tenuiter acutae, usque ad 12·5 cm. longae, usque ad 2 mm. latae, planae vel involutae, firmae, scaberulae. *Panicula* anguste oblonga, laxa, 10–25 cm. longa, 2·5 cm. lata, flexuosa; rhachis gracilis, laevis vel solum prope nodos scaberula; rami fasciculati, erecti vel adscendentes, tenuiter filiformes vel capillares, laeves, flexuosi, laxe divisi, inferiores usque ad 11 cm. longi et basi per 1·5–3·8 cm. nudati; pedicelli laeves, laterales 1–4 mm. longi, terminales longiores. *Spiculae* oblongae, demum hiantes, 3–3·5 mm. longae, viridi- et purpureo-variegatae; rhachilla in setam tenuissimam pilosam usque ad 1·2 mm. producta. *Glumae* a latere visae anguste lanceolatae et acutae, membranaceae, 3-nerves, nervis lateralibus brevibus, carinis superne scaberulae; inferior superiore paullo longior. *Lemma* explanatum late ovato-oblongum, truncatum, 2–2·4 mm. longum, denticulatum, tenuiter membranaceum, 5-nerve, nervis lateralibus excurrentibus extimis in mucrones usque ad 0·7 mm. longos productis; arista prope basin lemmatis orta, geniculata, usque ad 5 mm. longa, columna circiter 2 mm. longa; callus breviter barbatus.

*Palea* lanceolata, lemmati subaequilonga, nervis breviter excurrentibus. *Antherae* 1-1.3 mm. longae. *Caryopsis* anguste oblonga, 1.3 mm. longa.

TANGANYIKA TERRITORY: north slopes of Mt. Rungwe, forest margins, 2040-2240 m., *St. Clair-Thompson* 940.

***Agrostis gracilifolia*** C. E. Hubbard, sp. nov.; affinis *A. Volkensii* Stapf, sed culmis basin versus plerumque ramosis 2-5-nodibus, foliorum laminis laevibus, spiculis minoribus differt.

*Gramen* perenne dense caespitosum, usque ad 50 cm. altum; innovationes intravaginales. *Culmi* erecti, gracillimi, basin versus 2-5-nodes et ramosi, vel simplices, glabri, laeves, internodio summo elongato demum longe exserto. *Folia* glabra; vaginae imbricatae, pallidae, laeves; ligulae oblongae, truncatae vel obtusae, 1-4 mm. longae, membranaceae; laminae filiformes, setaceae, apice acutae vel subobtusae, usque ad 20 cm. longae, 0.25-0.5 mm. diametro, arcte convolutae vel involutae, explanatae usque ad 1.2 mm. latae, erectae, rigidiusculae, laeves. *Panicula* aperta, 3.8-12.5 cm. longa, 0.8-3.8 cm. lata, lanceolata vel ovata; rhachis laevis vel superne minute scaberula; rami 2-5-nati, tenuiter filiformes vel capillares, minute scaberuli vel fere laeves, trichotomo-divisi, spiculis approximatis, longiores basi per 1.5-2.5 cm. nudati, inferiores usque ad 3.8 cm. longi; pedicelli valde inaequales, 0.5-2.5 mm. longi, scaberuli. *Spiculae* lanceolatae, demum late hiantes, 2.4-2.5 mm. longae, virides vel purpureae; rhachilla pilosa, usque ad 0.5 mm. longa. *Glumae* aequales vel subaequales, a latere visae lanceolatae et acutae, firme membranaceae, carinis superne sparse scaberulae: inferior 1-3-nervis; superior 3-nervis. *Lemma* explanatum late ovatum vel oblongo-ovatum, anguste truncatum, 1.8 mm. longum, tenuiter membranaceum, 5-nerve, nervis lateralibus breviter excurrentibus, lateribus sparse pubescens vel glabrum, asperulum; arista prope basin lemmatis orta, geniculata, 3-4 mm. longa, columna 1.5 mm. longa; callus brevissime barbatus. *Palea* oblongo-lanceolata, 1.5-1.6 mm. longa. *Antherae* 0.6-1 mm. longae. *Caryopsis* 1.2 mm. longa.

UGANDA: Mt. Elgon, Bamboo zone, frequent, 3000 m., *Dummer* 3475; dominant grass in the bunch grass meadows, 3300-3900 m., *Liebenberg* 1689 (type); crater, cliff edges, 3900 m., *Dummer* 3334.

***Agrostis dissitiflora*** C. E. Hubbard, sp. nov.; *A. Volkenstii* Stapf affinis, foliorum laminis marginibus scaberulis exceptis laevibus arcte convolutis, panicula aperta, ramis rigidioribus, lemmate lateribus laxae vel sparse pubescente distinguitur.

*Gramen* perenne dense caespitosum, 5-32 cm. altum; innovationes intravaginales. *Culmi* erecti, graciles vel gracillimi, simplices, prope basin 1-nodes, glabri, laeves, internodio summo demum longe exserto. *Folia* glabra; vaginae arcte appressae, persistentes, pallidae, laevissimae; ligulae rotundato-obtusae, 0.5-2 mm. longae, membranaceae; laminae filiformes, setaceae, apice subacutae vel

obtusae, usque ad 10 cm. longae, arcte convolutae, 0.25–0.5 mm. diametro, erectae, rigidiusculae, marginibus scaberulae, ceterum laeves. *Panicula* lanceolata, laxa, aperta, 2–10 cm. longa, 1–3 cm. lata, erecta, rigidiuscula; rhachis gracillima, prope nodos asperula, ceterum laevis; rami 2–3-nati, oblique patentes, tenuiter filiformes, rigidiusculi, laeves, longiores basi per 0.5–1.3 cm. nudati, superne laxe divisi, inferiores usque ad 4 cm. longi; pedicelli fere laeves vel leviter scaberuli, valde inaequales, 0.5–4 mm. longi. *Spiculae* laxe dispositae, anguste ellipticae vel oblongae, demum hiantes, 2.5–3 mm. longae, purpureae vel viridi-variegatae; rhachilla in setam pilosam brevem producta. *Glumae* aequales vel subaequales, a latere visae anguste lanceolatae et acutae, firme membranaceae, carinis apicem versus minute scaberulae, 1–3-nerves, nervis laterilibus brevibus. *Lemma* explanatum late ovato-oblongum, truncatum, 1.8–2 mm. longum, hyalino-membranaceum, 5-nerve, nervis laterilibus breviter excurrentibus, lateribus laxe vel sparse pubescens; arista prope basin lemmatis orta, leviter geniculata, 3–4 mm. longa, columna 1.5–2 mm. longa; callus breviter barbatus. *Palea* lanceolato-oblonga, 1.5 mm. longa. *Antherae* 0.6 mm. longae. *Caryopsis* 1.5 mm. longae.

KENYA COLONY: Mt. Kenya, upper Bamboo region, in damp grassland, 2800 m., *Fries* 1284 (type); alpine region, 3500 m., *Fries* 1365, 1374; lower alpine region, *Fries* 1386.

***Agrostis leptophylla* C. E. Hubbard**, sp. nov.; ab *A. Volkensii* Stapf, foliorum laminis marginibus scaberulis exceptis laevibus gracilioribus, spiculis majoribus, glumis tenuiter acutis 3-nervibus, lemmate sparse pubescente vel glabro distinguenda.

*Gramen* perenne dense caespitosum, 10–60 cm. altum; innovationes intravaginales. *Culmi* erecti, gracillimi, simplices, enodes, glabri, laeves. *Folia* glabra; vaginae basi culmorum dense obtectae, pallidae, laevissimae; ligulae anguste oblongae, obtusae, 1–4 mm. longae, demum laceratae, membranaceae; laminae filiformes, setaceae, obtusae, 2.5–22 cm. longae, 0.3–0.5 mm. diametro, arcte involutae vel convolutae, erectae, rigidiusculae, estriatae, marginibus scaberulis exceptis laeves. *Panicula* laxa, erecta, 2.5–15 cm. longa, 0.8–4 cm. lata; rhachis gracillima, laevis vel fere laevis; rami tenuiter filiformes vel capillares, laeves vel sparse scaberuli, flexuosi, fasciculati vel bini, longiores basi per 1–2.5 cm. nudati, superne laxe divisi, inferiores usque ad 5 cm. longi; pedicelli inaequales, 0.5–7 mm. longi, sparse scaberuli. *Spiculae* anguste oblongae, demum late hiantes, 3.3–4.5 mm. longae, purpureae; rhachilla breviter producta, pilosa. *Glumae* aequales, vel superior inferiore paullo brevior, a latere visae anguste lanceolatae, carinis apicem versus minute scaberulae, firme membranaceae, 3-nerves. *Lemma* explanatum ovato-oblongum, anguste denticulato-truncatum, 2.4–3 mm. longum, tenuiter membranaceum, prope margines sparse pubescens vel glabrum, 5-nerve, nervis lateralibus excurrentibus extimis in mucrones usque ad 0.6 mm. longos productis; arista

prope basin lemmatis orta, geniculata, 4–5 mm. longa, columna 2 mm. longa; callus breviter et sparse barbatus. *Palea* oblongo-lanceolata, 2 mm. longa, nervis minute excurrentibus. *Antherae* 1.5 mm. longae. *Caryopsis* oblonga, 1.5 mm. longa.

UGANDA: Mt. Elgon, alpine zone, 3300–3900 m., *Johnston* 842, 876 (type); crater, moorland, one of the dominant grasses, 4050 m., *Dummer* 3339; 4200 m., *Dummer* 3376.

***Agrostis bryophila* C. E. Hubbard**, sp. nov.; *A. leptophyllae* C. E. Hubbard affinis, culmis et innovationibus laxiuscule caespitosis, foliorum laminis angustissime linearibus involutis vel planis latioribus, pulvinis atris in axillis ramorum et ramulorum, lemmate glabro differt.

*Gramen* perenne caespitosum, usque ad 35 cm. altum; innovationes intravaginales. *Culmi* e basi gracili plurinodi erecti, supra basin simplices et circiter 1-nodes, glabri, laeves, internodio summo elongato demum longe exserto. *Folia* glabra; vaginae imbricatae, laxiusculae, pallidae, laeves; ligulae truncatae vel obtusae, 1–1.5 mm. longae, membranaceae; laminae angustissime lineares, sub-setaceae, apice acutae vel subacutae, 4–10 cm. longae, involutae vel explanatae et usque ad 2 mm. latae, erectae, rigidiusculae, supra prominenter nervosae, laeves. *Panicula* erecta, laxa, 4–7.5 cm. longa, 1.3–2 cm. lata; rhachis gracilis, rigidiuscula, laevis vel superne leviter scaberula; rami 2–3-nati, adscendentes vel leviter patentes, rigidiusculi, basi nudati, superne laxe di- vel tri-chotomodivisi, laeves vel leviter scaberuli, inferiores usque ad 3.5 cm. longi; pedicelli valde inaequales, 1–5 mm. longi. *Spiculae* lanceolatae, demum hiantes, 3–4 mm. longae, purpurascentes vel virides; rhachilla producta, usque ad 0.5 mm. longa, minute pilosa, lemma aristatum raro gerens. *Glumae* aequales vel superior inferiore paullo brevior, a latere visae anguste lanceolatae, acutae, firme membranaceae vel basin versus coriaceae, carinis apicem versus minute scaberulae, ceterum laeves, 3-nerves vel inferior 1-nervis. *Lemma* explanatum late oblongum vel ovato-oblongum, denticulato-truncatum vel minute 4-dentatum, 2.5 mm. longum, tenuiter membranaceum, glabrum, 5-nerve, nervis lateralibus breviter excurrentibus; arista in parte quarta inferiore orta, leviter geniculata, 4–5 mm. longa, columna 2 mm. longa; callus sparse puberulus. *Palea* oblongo-lanceolata, 2.5 mm. longa. *Antherae* 1 mm. longae. *Caryopsis* 2 mm. longa.

UGANDA: Mt. Ruwenzori, *Henderson*; 3750 m., *Humphreys* 520; Bukuku Valley, 3240 m., *Eggeling* 1288; in moss, 3750 m., *Fishlock and Hancock* 111 (type); Namwanda Valley, on banks of R. Namwamba, 3120 m., *Taylor* 2972; dominant in parts of the swamp, 3900 m., *Taylor* 3010.

***Agrostis Uhligii* C. E. Hubbard**, sp. nov.; affinis *A. alpicolae* Hochst., sed culmis erectis et innovationibus dense caespitosis, lemmate piloso, palea lemmati aequilonga bimucronulata differt.

*Gramen* perenne dense caespitosum ; innovationes intravaginales. *Culmi* erecti, graciles, simplices, basi 1-nodes, prope paniculam asperuli, ceterum laeves. *Folia* glabra ; vaginae laeves ; ligulae oblongae, obtusae, denticulatae, 2-6 mm. longae ; laminae angustissime lineares, subsetaceae, apice obtusae, usque ad 15 cm. longae, conduplicatae vel conduplicato-involutae, explanatae usque ad 2 mm. latae, erectae, rigidiusculae, asperulae. *Panicula* lanceolata vel anguste ovata, laxa, 5-11 cm. longa, usque ad 2.5 cm. lata ; rhachis inferne laevis ; rami oblique patentes, subcapillares, flexuosi, scaberuli vel fere laeves, sparse divisi, paucispiculati, inferiores fasciculati, usque ad 4.5 cm. longi, superiores plerumque bini ; pedicelli inaequales, 2-12 mm. longi. *Spiculae* oblongae, demum hiantes, 4-5 mm. longae, purpureo-tinctae ; rhachilla usque ad 1 mm. producta, pubescens, nonnunquam setam tenuem scaberulam usque ad 2 mm. longam gerens. *Gluma* a latere visae anguste lanceolatae, acutae, firme membranaceae, carina superne scaberulae, 3-nerves ; inferior superiore paullo longior. *Lemma* explanatum oblongo-ovatum, denticulato-truncatum, 2.6-3 mm. longum, tenuiter membranaceum, parte tertia superiore excepta pilosum, 5-nerve, nervis lateralibus breviter excurrentibus ; arista prope basin lemmatis orta, leviter geniculata, usque ad 5 mm. longa, columnna 2 mm. longa ; callus dense et breviter barbatus. *Palea* lanceolata, lemmati aequilonga, 2-nervis, nervibus breviter excurrentibus. *Antherae* circiter 1 mm. longae.

TANGANYIKA TERRITORY : Mt. Meru, 3480-3780 m., *Uhlig* 610 (type), 1068.

*Agrostis Uhligii* C. E. Hubbard var. *contracta* C. E. Hubbard, var. nov. ; a typo culmis brevioribus usque ad 16 cm. altis, ligulis brevioribus 1.5-2 mm. longis, foliorum laminis filiformibus setaceis usque ad 5 cm. longis convolutis vel planis et circiter 1 mm. latis, panicula lineari contracta usque ad 5 cm. longa circiter 0.6 mm. lata, spiculis 3.5-4 mm. longis, glumis 1-3-nervibus differt.

TANGANYIKA TERRITORY : Mt. Kilimanjaro, 3000 m., *Grote* 6320 ; foot of Kibo, 4800 m., *Uhlig* 71 (type) ; Mt. Meru, 3780 m., *Uhlig* 613 (in part).

*Agrostis sclerophylla* C. E. Hubbard, nom. nov. *Sporobolus alpicola* Hochst. ex A. Rich. Tent. Fl. Abyss. 2, 395 (1851), non *Agrostis alpicola* Hochst. (1855). *Vilfa alpicola* Steud. Syn. Pl. Glum. 1, 154 (1854). *Agrostis depressa* Mez ex Pilger in Notizbl. Bot. Gart. Berlin, 9, 510 (1926), in obs., non Vasey (1886).

*Distr.* Abyssinia : Samen ; Mt. Silke, at the summit, between rocks, *Schimper* 669.

### New Species from West Tropical Africa.

C. E. Hubbard.

*Eragrostis chalarothyrsos* C. E. Hubbard, sp. nov. ; affinis *E. paniciformi* (A.Br.) Steud., sed culmis validioribus altioribus

4-6-nodibus, panícula majore, lemmatibus acuminatis a latere visis ovato-ellipticis vel ellipticis, palearum carinis dense scaberulis, caryopside grisea delicate reticulata differt.

*Gramen* perenne, caespitosum, 0.9-1.5 m. altum. *Culmi* erecti, validi, teretes vel uno latere sulcati, simplices vel inferne ramosi, 4-6-nodes, glabri, laeves. *Folia* glabra; vaginae internodiis breviores, laeves; ligulae ad seriem ciliorum minorum redactae; laminae lineares, in acumen tenue longe attenuatae, usque ad 30 cm. longae et 6 mm. latae, siccitate convolutae, erectae, rigidae, supra nervis asperulae, subtus laeves. *Panicula* elliptica, laxissima, usque ad 40 cm. longa et 25 cm. lata; rhachis glabra, superne flexuosa et scaberula; rami solitarii, patentes, laxissime divisi, flexuosi, graciles, scabridi; pedicelli laterales 2-10 mm. longi, terminales 6-18 mm. longi. *Spiculae* laxissime dispositae, oblongae, 6-12 mm. longae, 3-3.5 mm. latae, lateraliter compressae, pallide griseae, 12-30-florae; rhachilla persistens, glabra, internodiis brevissimis. *Glumae* delapsae. *Lemmata* arcte imbricata, a latere visa ovato-elliptica, acuta, acuminata, explanata late elliptica, 2-2.4 mm. longa, chartacea, asperula. *Paleae* deciduae, ellipticae, obtusae, 2 mm. longae, tenuiter membranaceae, carinis dense scaberulis. *Antherae* 1 mm. longae. *Caryopsis* oblonga, teres, 1 mm. longa, grisea, delicate reticulata.

SIERRA LEONE: Northern Territories; Mange, in grassfields along the Little Scarcies River, *Glanville* 240.

***Eragrostis Barteri*** C. E. Hubbard, sp. nov.; ab *E. gangetica* (Roxb.) Steud., habitu annuo, culmis geniculato-adscendentibus 6-8-nodibus, lemmatibus longioribus a latere visis oblongo-lanceolatis vel oblique lanceolatis differt.

*Gramen* annuum, usque ad 45 cm. altum. *Culmi* geniculato-adscendentes, e nodis inferioribus radicanter, moderate graciles, simplices vel basin versus ramosi, circiter 6-8-nodes, prope nodos pruinosi, glabri, laeves. *Foliorum vaginae* internodiis longiores vel aequilongae, glabrae, laeves; ligulae truncatae, usque ad 0.4 mm. longae, minutissime ciliatae; laminae lineares, in acumen tenue attenuatae, usque ad 18 cm. longae et 5 mm. latae, planae vel siccitate convolutae, glabrae, nervis asperulae. *Panicula* oblonga, contracta, usque ad 20 cm. longa et 7 cm. lata; rhachis glabra, laevis; rami solitarii, erecti vel leviter patentes, gracillimi, flexuosi, laxè divisi, superne scaberuli, inferiores usque ad 8 cm. longi; pedicelli laterales 0.5-2 mm. longi. *Spiculae* oblongae, lateraliter compressae, 6-13 mm. longae, 2-3 mm. latae, 10-20-florae, stramineae et purpureo-tinctae; rhachilla persistens, glabra. *Glumae* lanceolatae, acutae, membranaceae, 1-nerves, carina superne scaberulae; inferior 2.5-2.8 mm. longa; superior 2.8-3.2 mm. longa. *Lemmata* a latere visa oblongo-lanceolata vel oblique lanceolata, explanata oblongo-ovata vel ovata, acuta vel subobtusata, 3-3.3 mm. longa, firme membranacea, glabra. *Paleae* deciduae,

oblongae, truncatae, 2-2.8 mm. longae, tenuiter membranaceae, carinis scaberulis. *Antherae* 1 mm. longae.

NORTHERN NIGERIA: Nupe, in cultivated ground, *Barter* 877.

**Eragrostis Glanvillei** C. E. Hubbard, sp. nov. ; affinis *E. invalidae* Pilger, sed culmis validioribus, foliorum laminis latioribus planis vel siccitate convolutis, vaginis inferioribus plerumque pilosis, paleis explanatis late ellipticis, alis latioribus differt.

*Gramen* perenne, dense caespitosum, circiter 1 m. altum. *Culmi* erecti vel leviter geniculati, moderate validi vel graciles, simplices, 3-5-nodes, glabri, laeves. *Foliorum vaginae* internodiis plerumque longiores, inferiores solutae, pilis patulis laxe villosae vel glabrescentes, superiores glabrae, laeves ; ligulae ad seriem ciliorum minorum redactae ; laminae lineares, in acumen tenue durum attenuatae, usque ad 30 cm. longae et 6 mm. latae, planae vel siccitate convolutae, supra nervis asperulae et pilis debilibus laxe pilosae vel glabrae, subtus glabrae et laeves. *Panicula* late elliptica vel oblonga, laxa, nutans, usque ad 25 cm. longa et 12 cm. lata ; rhachis nodis inferioribus pubescens, superne scaberula ; rami solitarii, gracillimi, laxe divisi, scaberuli, usque ad 12 cm. longi ; pedicelli 3-25 mm. longi, capillares, scaberuli. *Spiculae* ovatae vel oblongae vel elliptico-oblongae, 6-14 mm. longae, 3.5-5.5 mm. latae, latera-liter compressae, 10-30-florae, stramineae vel pallide purpureo-tinctae ; rhachilla persistens (?), glabra, internodiis brevissimis. *Glumae* explanatae lanceolatae, acutae, membranaceae, subaequales, 2-3 mm. longae, 1-nerves, carina scaberulae. *Lemmata* a latere visa anguste lanceolata, acuta, explanata lanceolata, 3-3.3 mm. longa, firme membranacea, glabra, carina apicem versus minute scaberula. *Paleae* deciduae, late ellipticae, acuminatae, 2.5-3 mm. longae, carinis late alatis, alis 0.5-0.6 mm. latis. *Antherae* 1 mm. longae. *Caryopsis* ellipsoidea, 1-1.3 mm. longa.

SIERRA LEONE : near Kayihi, on granite outcrop, 30 m., *Glanville* 426 (type).

NORTHERN NIGERIA : Naraguta, on plains, *Lely* 450.

**Eragrostis Pobeguini** C. E. Hubbard, sp. nov. ; affinis *E. denuadatae* Hack., sed culmis plus minusve pilosis, panicula lineari, ramis erectis, glumis angustioribus paullo longioribus, lemmatibus laxioribus angustioribus acutis vel subacutis differt.

*Gramen* perenne, caespitosum, usque ad 40 cm. altum. *Culmi* erecti, graciles, simplices, 1-2-nodes, sparse et appresse pilosi vel glabrescentes. *Folia* plerumque basalia ; vaginae tenuiter striatae, arcte appressae, internodiis breviores, laxe pilosae vel fere glabrae ; ligulae ad seriem ciliorum minorum redactae ; laminae anguste lineares, apice tenuissimae et flexuosae, usque ad 20 cm. longae, planae vel convolutae, usque ad 2 mm. latae, rigidiusculae, striatae, pilis e tuberculis minutis ortis pilosae. *Panicula* angusta, linearis, 8-12 cm. longa, 0.7-1 cm. lata, erecta, contracta, interrupta, superne simplex ; rhachis appresse pilosa vel glabra ; rami erecti, solitarii, gracillimi,

scabridi, inferiores laxae 2-4-spiculati, usque ad 3 cm. longi, superiores 2-1-spiculati; pedicelli laterales 1-2 mm. longi, terminales usque ad 12 mm. longi. *Spiculae* oblongae, lateraliter valde compressae, 7-18 mm. longae, 3-5-4-5 mm. latae, erectae vel oblique erectae, 8-26-florae, flavido-virides; rhachilla persistens (?), laevis. *Glumae* membranaceae; inferior explanata lanceolato-oblonga, obtusa vel acuta, 1-5-2-8 mm. longa, 1-nervis; superior explanata lanceolato- vel ovato-oblonga, acuta, 2-3 mm. longa, 3-nervis. *Lemmata* laxae imbricata, a latere visa oblique et anguste ovata, acuta, explanata late ovata, 3-3-2 mm. longa, firme membranacea, 3-nerve, glabra, carina apicem versus scaberula, ceterum laeve. *Paleae* deciduae, oblongae, truncatae, circiter 3 mm. longae, carinis anguste alatis, alis scaberulis. *Antherae* 1-1-3 mm. longae.

FRENCH GUINEA: Timbo, June 1902, *Pobéguin* 1092.

***Leersia triandra* C. E. Hubbard**, sp. nov.; a *L. monandra* Sw., culmis e basi prostrata nodis radicanibus geniculato-adscendentibus, ligulis brevissimis, spiculis pilis minutis rigidis appressis sparse praeditis, antheris tribus differt.

*Gramen* perenne (?), usque ad 30 cm. altum. *Culmi* e basi prostrata nodis radicanibus geniculato-adscendentes, graciles, debiles, simplices, multinodes, glabri, laeves. *Foliorum vaginae* internodiis plerumque breviores, superne carinatae, marginibus ciliolatae, ceterum glabrae, laeves; ligulae brevissimae, truncatae, membranaceae; laminae lineares, tenuiter acutae, usque ad 6 cm. longae et 4 mm. latae, planae, marginibus ciliolatae, ceterum glabrae. *Panicula* angusta, gracillima, laxa, pallida, 5 cm. longa, 0-6 cm. lata; axis primarius et rami tenuiter filiformi; rami erecti, solitarii, inferne nudati, superne 1-3 racemos gerentes, asperuli, usque ad 3 cm. longi; pedicelli 0-5-1-5 mm. longi. *Spiculae* late oblongo-ellipticae, 2 mm. longae, circiter 1 mm. latae, pilis rigidis minutis appressis sparse praeditae. *Lemma* late semi-ellipticum vel elliptico-oblongum, oblique subacutum, tenuiter coriaceum, 5-nerve. *Palea* lemmati subsimilis sed eo multo angustior. *Antherae* 3, 1 mm. longae.

SIERRA LEONE: Northern Province; near Konta, between Kasokora and Bumban, in marsh, rare, August 1928, *Deighton* 1241.

***Monocymbium lanceolatum* C. E. Hubbard**, sp. nov.; a *M. ceresiiformi* (Nees) Stapf, culmis e basi elongata procumbente geniculato-adscendentibus multinodibus, foliorum laminis lanceolatis latioribus brevioribus basi rotundatis, spatheolis angustioribus, pedunculis longioribus, racemis demum lateraliter exsertis, spicularum sessilium gluma inferiore 9-15-nervi distinguendum.

*Gramen* perenne, usque ad 1-2 m. altum. *Culmi* e basi elongata multinodi procumbente geniculato-adscendentes, e nodis inferioribus radicanes, moderate validi, teretes, multinodes, internodiis 2-5-5 cm. longis, duri, infra inflorescentiam simplices vel sparse ramosi, glabri, laeves. *Foliorum vaginae* internodiis breviores, teretes,



striatae, purpureo-suffusae, glabrae et laeves vel superne pilis patulis e tuberculis ortis villosae vel pilosae; ligulae rotundato-truncatae, usque ad 1 mm. longae, membranaceae, glabrae; laminae lanceolatae, basi rotundatae, acutae, 4.5-9 cm. longae, 1-2 cm. latae, planae, firmae, subtus glaucae, glabrae vel marginibus basin versus laxe longe ciliatae, marginibus supra medium spinuloso-scabridae, ceterum laeves, costa media tenuissima, nervis lateralibus 14-16. *Inflorescentia* spathata, angusta, laxissima, 20-45 cm. longa, nutans; axis primarius gracillimus, uno latere sulcatus, prope nodos pilosus; rami filiformes, apicem versus plus minusve pilosi, ceterum glabri, laeves, elongati, simplices vel sparse divisi; spatheolae anguste cymbiformes, acutae, 2-3 cm. longae, a latere visae 1.5-2 mm. latae, tenuiter chartaceae, rubro-brunneae, glabrae vel basin versus pilis paucis praeditae, laeves; pedunculi tenuiter filiformes, 4-18 mm. longi, prope apicem puberuli. *Racemi* 12-22 mm. longi, 5-10-aristati, demum lateraliter exserti, straminei; rhacheos internodia 1.5 mm. longa, breviter ciliata; pedicelli internodiis similes, 2 mm. longi. *Spiculae sessiles* lanceolatae, vel lanceolato- vel anguste elliptico-oblongae, subacutae, 3.5-4 mm. longae, fere glabrae vel pilis albis brevibus plus minusve villosae. *Gluma inferior* 9-15-nervis, carinis supra medium spinuloso-ciliolata; gluma superior lanceolata, minutissime biloba, marginibus molliter ciliolatis. *Anthoecium inferum*: lemma oblongum, truncatum vel emarginatum, 3-3.5 mm. longum, enerve, ciliolatum. *Anthoecium superum*: lemma lineare, 2.5-3 mm. longum, usque medium bifidum, lobis angustis acutis, arista geniculata, 12-16 mm. longa, scaberula; antherae 2 mm. longae. *Spiculae pedicellatae* anguste lanceolato-oblongae vel lineari-oblongae, 3-4.5 mm. longae, fere glabrae vel plus minusve breviter villosae; gluma inferior 13-15-nervis; gluma superior 5-nervis.

SIERRA LEONE: between Mamaria and Kulufaga, *Glanville* 337 (type); Fontane, open places in bush country, *Glanville* 100.

Glanville states that this grass is frequent in the Mamaria and Kulufaga area, in sheltered moist but open situations, such as are found by the riverside in damp valleys. The vegetation there is secondary bush; he has not seen it in orchard bush.

### New Species from Uganda.

J. D. Snowden & C. E. Hubbard.

***Saccolipsis Johnstonii*** C. E. Hubbard et Snowden, sp. nov.; a *S. rigente* (Mez) Chevalier, culmis 4-5-nodibus, auriculis brevioribus, spiculis minoribus 3-3.5 mm. longis distinguenda.

*Gramen* perenne, usque ad 1 m. altum, e rhizomate modice valido ortum. *Culmi* erecti vel suberecti, validiusculi, prope basin usque ad 4 mm. lati, 4-5-nodes, simplices, teretes, glabri, laeves. *Folia* glabra; vaginae striatae, laeves, apice plerumque auriculatae, auriculis 2-3 mm. longis, inferiores internodiis longiores, superiores iis multo breviores; ligulae truncatae, membranaceae, 0.5-1 mm. longae, auriculis adnatae; laminae lineares, tenuiter acutae, usque

ad 25 cm. longae, 3–7 mm. latae, planae, firmae, laeves, virides, costa media graciliuscula. *Panicula* spiciformis, longe exserta, cylindrica, densa, 4–8 cm. longa, 6–7 mm. lata; rhachis laevis; pedicelli 0.5–1.5 mm. longi, apice patelliformes. *Spiculae* oblique ovatae vel oblique elliptico-ovatae, acutae, 3–3.5 mm. longae, 1–1.5 mm. latae, glabrae, purpureo-tinctae. *Gluma inferior* late ovata, obtusa, tertiam vel dimidiam partem spiculae aequans, 5-nervis, nervis superne minute asperula, tenuiter membranacea; gluma superior spiculae aequilonga, explanata late ovato-oblonga, obtusa, prominenter 9-nervis, membranacea. *Anthoecium inferum* vel ♂ vel sterile: lemma glumae superiori subsimile; palea lanceolata, truncata, usque ad 2 mm. longa, hyalina; antherae 2 mm. longae. *Anthoecium superum*, ♀, elliptico-oblongum, subacutum, 1.8–2 mm. longum, circiter 0.7 mm. latum: lemma et palea demum tenuiter crustacea; antherae 1.5 mm. longae.

UGANDA: Lango District, in low-lying rain-flooded areas, June 1934, Johnston 938.

***Echinochloa ugandensis*** Snowden et C. E. Hubbard, sp. nov.; affinis *E. stagninae* (Retz.) Beauv, sed habitu annuo, foliorum laminis multo angustioribus, spiculis minoribus differt.

*Gramen* annuum. *Culmi* erecti, 0.4–1 m. alti, graciles vel validiusculi, compressi, inferne spongiosi, 3–4-nodes, plerumque simplices vel nonnunquam ramosi, glabri laevesque; nodi inferiores laxè barbati vel glabri. *Foliorum vaginae* laxae, glabrae, laeves, inferiores compressae et carinatae; ligulae ad seriem ciliorum densorum redactae; laminae anguste lineares, tenuiter acutae, 10–30 cm. longae, 2–5 mm. latae, planae vel conduplicatae, firmae, glabrae vel minute pubescentes, marginibus cartilagineis scaberulis. *Panicula* erecta, fere recta, linearis, laxa vel densiuscula, 8–20 cm. longa, 1–3.5 cm. lata; axis primarius gracilis, tenuiter striatus, scabridus vel superne minute et dense scabrido-pubescent. *Racemi* 6–25, solitarii, erecti vel leviter oblique patentes, densi, 4–6 mm. lati, inferiores 1–3 cm. distantes et 2–4 cm. longi, superiores gradatim breviores, summi circiter 1 cm. longi; rhachis triquetra, 0.2–0.5 mm. lata, angulis dense scabrida, pilis longis rigidis plerumque laxè adspersa; pedicelli bini vel fasciculati, brevissimi, scabridi. *Spiculae* 4-seriatae, ellipticae vel elliptico-ovatae, cuspidatae vel aristatae, 3–3.5 mm. longae, pallide virides vel purpureo-suffusae. *Glumae* tenuiter membranaceae, nervis scabridae vel hispidulae, inter nervos minute et rigide pubescentes; inferior late ovata vel oblata, breviter acuminata, mucronulata, 1.5–2 mm. longa, 5–7-nervis, marginibus rigide ciliolata; superior elliptico-ovata (explanata), caudato-acuminata, spiculae aequilonga. *Anthoecium inferum* ♂: lemma glumae superiori simile sed in aristam rigidam scabridam usque ad 6 mm. longam attenuatum, 5–7-nerve; palea carinis scaberula. *Anthoecium superum*: lemma ellipticum, 2.8–3 mm. longum, breviter cuspidatum, coriaceum, apicem versus ciliolatum. *Antherae* 1.8–2 mm. longae.

UGANDA : Mengo District, Kyagwe, Bulumage, in pool, 1200 m., *Dummer* 4114 ; Teso District, Abela, Liebenberg 851 (type); Serere, in shallow soil, 1080 m., *Chandler*, 919.

This species is somewhat intermediate between *E. haploclada* Stapf and *E. stagnina* Beauv., but differs from both by being an annual and by its very narrow leaf-blades. It may also be distinguished from *E. haploclada* by the presence of a hairy ligule, the somewhat larger spikelets, longer 5-7-nerved lower glume, and rather looser panicle. *E. ugandensis* agrees with *E. stagnina* in possessing a hairy ligule and in the shape of the panicle, but the spikelets are smaller than in the most reduced forms of that species.

***Sorghum castaneum*** C. E. Hubbard et Snowden, sp. nov.; a *S. verticillifloro* (Steud.) Stapf, spiculis sessilibus minoribus late ellipticis vel elliptico-oblongis, gluma inferiore 8-11-nervi, caryopsidibus late obovatis vel obovato-rotundis distinguendum.

*Gramen* perenne, usque ad 2.4 m. altum. *Culmi* erecti, basin versus 7-8 mm. diametro, robusti, simplices vel ramosi, prope nodos leviter pruinosi, glabri, laeves. *Folia* 6-7 ; vaginae demum internodiis breviores, nodis appresse pubescentes ; ligulae truncatae vel rotundatae, 2-2.5 mm. longae, scariosae, rigide ciliatae ; laminae lineares, basi rotundatae, in apicem tenuem longe attenuatae, usque ad 40 cm. longae et 2.7 cm. latae, planae, virides, nonnunquam leviter glaucae vel purpureo-suffusae, prope ligulam hirsutae, ceterum glabrae, marginibus superne scabridis. *Panicula* lanceolato- vel ovato-oblonga, laxa, nutans, circiter 40 cm. longa et 10-15 cm. lata ; axis primarius angulatus, nodis dense villosulus, ceterum glaber ; rami 2-4-nati vel solitarii, graciles, flexuosi, superne scabridi, basin versus nudati, superne laxe divisi, inferiores usque ad 20 cm. longi. *Racemi* fragiles, 2-5-nodes, usque ad 15 mm. longi ; rhacheos internodia gracillima, 2-3.5 mm. longa, pilis fulvis dense ciliata ; pedicelli internodiis similes. *Spiculae* sessiles late ellipticae vel elliptico-oblongae, obtusae, 4-4.5 mm. longae, 2-2.5 mm. latae, demum castaneae vel atro-brunneae ; callus breviter barbatus. *Glumae* aequales, apice chartaceo excepto coriaceae, pilis fulvis rigidiusculis brevibus appresse hirsutae vel dorso glabrescentes ; inferior dorso leviter convexa, nitens, 8-11-nervis ; superior ovata, acuta, dorso convexa, apicem versus carinata, 7-nervis, marginibus angustis incurvis hyalinis ciliatis. *Lemmata* hyalina, ciliata ; inferius elliptico-ovatum vel ellipticum, 4-4.5 mm. longum, 2-nerve ; superius ovatum vel oblongum, 3 mm. longum, breviter bilobum ; arista 9-11 mm. longa ; palea lanceolata, usque ad 2 mm. longa, ciliata ; lodiculae ciliolatae ; antherae 2.5 mm. longae ; caryopsis obovata vel obovato-rotunda, 2-2.5 mm. longa, 1.5-1.7 mm. lata, plano-convexa. *Spiculae pedicellatae* vel ♂ vel steriles, tarde deciduae, lineari-lanceolatae, subacutae, 4-4.5 mm. longae. *Gluma* inferior 8-9-nervis ; gluma superior 7-8-nervis.

UGANDA : Toro District ; Bwamba, Bubandi, in Elephant Grass zone, frequent, 1050 m., *Thomas* 714.

## The Genera of the Tribe Arundinelleae.

C. E. Hubbard.

The genera of the *Arundinelleae* have been referred to various tribes and there is still no uniformity in their classification. In 1827, Link (Hort. Berol. 1, 231) proposed the suborder *Tristeginae* for the genera *Acratherum* Link (= *Arundinella* Raddi), *Tristegis* Nees (= *Melinis* Beauv.), *Arrhenatherum* Beauv., and *Holcus* L. Later Nees (in Hook. & Arnott, Bot. Beech. Voy. 237 : 1836) reduced this suborder to tribal rank, and included in it the genus *Arundinella*. Up to the end of the 19th century many botanists still placed *Arundinella* in the *Tristegineae*, including Bentham (Benth. et Hook. f. Gen. Pl. 3, 1118 : 1883) and Hackel (Engl. u Prantl, Nat. Pflanzenf. 2, Abt. 2, 32 : 1887), while the same authors referred the allied genera, *Tristachya* Nees and *Trichopteryx* Nees to the tribe *Aveneae*. Stapf in preparing the account of the *Gramineae* for the Flora Capensis, realized the close relationship existing between *Arundinella*, *Trichopteryx* and *Tristachya*, and grouped them together in a new tribe—*Arundinelleae* (Dyer, Fl. Cap. 1, 314 : 1898). The *Tristegineae* did not find a place in his scheme of classification, as *Tristegis* (= *Melinis*), the type-genus, was referred to the *Paniceae*. The tribe *Arundinelleae* was adopted by Rendle (Cat. Afr. Pl. Welw. 2, 214 : 1899) and by Hooker (in Trimen, Fl. Ceyl. 5, 116 : 1900), whilst more recently Mez (in Fedde, Repert. 17, 84 : 1921), apparently unaware of Stapf's proposal, has described it as a new tribe. Janowski (in Mez, Bot. Arch. 1, 21 : 1922) gives a conspectus of the tribe and includes in it, *Arundinella*, *Thysanolaena*, *Phaenosperma* and *Beckera*, but excludes *Trichopteryx* and *Tristachya*. Three of the above genera are referred by me to other tribes :—*Thysanolaena* to the *Thysanolaeneae*, *Phaenosperma* to the *Stipeae* (following Stapf), and *Beckera* to the *Paniceae* on account of its relationship to *Beckeropsis*. Hitchcock, in his account of the grasses of Ecuador, Peru and Bolivia (Contrib. U.S. Nat. Herb. 24, 304 : 1927), referred *Tristachya*, *Trichopteryx* and *Arundinella* to the *Melinideae*, but noted that they differed in certain respects from *Melinis* and its allies. Whether or not the *Tristegineae* or *Melinideae* be retained as a distinct tribe for *Melinis* Beauv., *Rhynchelytrum* Nees and *Tricholaena* L. f. is a matter which requires further consideration, but in any case it should not include *Arundinella* and its allies. The latter form a very natural group which may be distinguished from *Melinis* and related genera by the persistent well-developed glumes, awnless and entire lower lemma, and usually awned scaberulous or hairy (rarely glabrous) upper lemma.

### KEY TO THE GENERA.

- \*Lemma of the upper floret scabrid or scaberulous, entire, emarginate or minutely and obscurely 2-lobed at the apex, with the lobes muticous or each bearing a capillary bristle, awned or awnless ;

- upper floret with a minute obtuse or truncate callus ; anthers 3 ; ovary glabrous ; lower lemma 3-7-nerved ; spikelets green, greyish or purplish, paired or solitary.....1. *Arundinella*.
- \*Lemma of the upper floret more or less hairy, with the hairs evenly disposed or arranged in transverse rows or tufts, rarely glabrous and then quite smooth, usually conspicuously 2-lobed or 2-fid at the apex, always awned :
- Palea of the lower floret thin, usually membranous, linear to narrowly oblong, rarely suppressed ; lower glume usually awnless :
- Spikelets mostly paired, rarely solitary or in threes, in the latter case with the spikelets pedicelled and with the lower glume narrowly ovate to broadly ovate-elliptic or ovate-oblong ; anthers 2-3 ; ovary glabrous :
- Lemma of the upper floret transversely bearded with 6-8 tufts of hairs, or with a dense row of hairs across the back, or with a tuft of hairs below each lobe, deeply 2-lobed, rather thin :
- Lemma of the lower floret 5-11- (rarely 3-) nerved ; lemma of the upper floret transversely bearded with a continuous row of hairs below each lobe or with 6 to 8 tufts of hairs ; anthers 3 ; keels of the palea of the upper floret usually winged, the wings bearing an appendage at the apex ; spikelets mostly greenish or purplish .....2. *Danthoniopsis*.
- Lemma of the lower floret 3- (rarely 1-) nerved ; lemma of the upper floret with a tuft of hairs below each lobe and near the margins, its lobes usually bearing a capillary bristle ; anthers 2 ; keels of the palea of the upper floret very narrowly winged and without appendages ; spikelets brown or reddish-brown.....
3. *Trichopteryx*.
- Lemma of the upper floret evenly pubescent to pilose, or glabrous except for the bearded basal callus, becoming rigid and coriaceous at maturity, shortly 2-lobed, with the lobes awnless ; anthers 2-3 ; keels of the palea of the upper floret without wings or appendages.....
4. *Loudetia*.
- Spikelets sessile or shortly pedicelled in threes at the ends of the branches of panicles or racemes ; glumes narrowly lanceolate to linear-lanceolate ; anthers 2-3 ; ovary glabrous or hairy ; lemma of the lower floret 3-7-nerved ; palea of the upper floret with wingless unappendaged keels .....5. *Tristachya*.
- Palea of the lower floret indurated and thickened between the keels, oblanceolate to linear ; lower glume long-awned ; lemma of the lower floret 5-7-nerved ; lemma of the upper floret with 1 or 2 tufts of hairs below each lobe, the lobes shortly awned ; panicle spike-like.....6. *Gilgichloa*.

## ENUMERATION OF GENERA.

### 1. *Arundinella Raddi*, Agrost. Bras. 37, t.1, fig. 3 (1823).

Species 35–40; mainly in tropical and subtropical Asia and America, two each in Africa and Australia, one in Madagascar. Type species: *A. brasiliensis* Raddi=*A. hispida* (Willd.) O. Kuntze.

### 2. *Danthoniopsis Stapf* in Hook. Ic. Pl. 31, t. 3075 (1916).

Species 8; tropical Africa, extending to tropical Arabia, Baluchistan and Sind. Type species: *D. Gossweileri* Stapf=*D. viridis* (Rendle) C. E. Hubbard.

### 3. *Trichopteryx* Nees in Lindl. Nat. Syst. ed. 2, 449 (1836).

Species 7, in tropical and South Africa and Madagascar. Type species: *T. Dregeana* Nees. Lindley spelt the generic name *Trichopteria*, but Nees (Fl. Afr. Austr. 339: 1841) states that this is a typographical error.

### 4. *Loudetia* Hochst. ex Steud. Syn. Pl. Glum. 1, 238 (1854).

Species about 40; mainly in tropical Africa, extending into South Africa and Madagascar, one in tropical South America. Type species: *L. elegans* Hochst.

The genus *Loudetia* was first proposed by Hochstetter for an Abyssinian grass collected by Schimper. The name *Loudetia elegans* appeared on printed labels with the specimens, and also in a list in Flora, 24, 1, Intell. 20 (1841), but in each case it was unaccompanied by a description. Later, A. Braun in Flora, 24, 2, 713 (1841) discussed *Loudetia* and *Tristachya*, and considered that the differences between the two were insufficient to retain them as distinct genera. As the earlier name *Tristachya* Nees was, in his opinion, unsuitable for the species placed under *Loudetia* (e.g. *L. elegans*), he adopted the latter generic name and included *Tristachya* as a section under it. This application of the name *Loudetia* Hochst. by A. Braun was illegitimate, since, with his classification, *Loudetia* was a superfluous name for *Tristachya*. A. Braun, however, validated the name *Loudetia elegans* by giving a brief description of the species. In 1852, De Notaris published the description of a second species, *Loudetia superba* in Ind. Sem. Hort. Genuensis (reprinted in Ann. Sci. Nat. sér. 3, 19, 369; 1853). This epithet is validly published. The valid publication of the generic name *Loudetia* dates from Steudel (Syn. Pl. Glum. 1, 238; 1854), who supplied a generic description (excluding *Tristachya*). The name *Loudetia* Hochst. ex Steud. as used by him is not a later homonym, since it is based on the same type as the illegitimately applied name *Loudetia* A. Br. Thus the date of valid publication of the two binomials, *Loudetia elegans* and *L. superba* precedes the date of publication of the generic name *Loudetia*.

The above nomenclatural account has been written in collaboration with Dr. T. A. Sprague.

# KEY TO THE SECTIONS AND SUBSECTIONS OF LOUDETIA.

\*Anthoecium inferum ♂; antherarum apices glabri; aristae usque ad 12·5 cm. longae :

Lemma inferius 3-nerve, vel si 5-7-nerve tum callo anthoecii superi truncato vel rotundato-truncato et spiculis usque ad 10 mm. longis ; stamina 2-3 :

Spiculae binae vel solitariae :

Lemma inferius 3-nerve ; lemma superius brevissime bilobum vel integrum .....I. *Eu-Loudetia*.

Lemma superius pilis longis laxo pilosum ; callus truncatus, circiter 0·3 mm. longus ; aristae usque ad 2·5 cm. longae ; gramina perennia arundinacea ; culmi validi ; panicula usque ad 60 cm. longa, dense contracta.....

a. *Flammidae*.

Lemma superius pubescens vel glabrescens ; callus pungens, bidentatus, emarginatus vel truncatus, 0·4-2 mm. longus ; aristae plerumque 2·5-12·5 cm. longae ; culmi graciles vel validi :

Gramina perennia, plerumque dense caespitosum ; lemma inferius tres quadrantes spiculae aequans vel spiculae aequilongum ; aristae usque ad 7 cm. longae :

Panicula laxa vel contracta, haud spiciformis, usque ad 15 cm. lata ; rami plus 1 cm. longi :

Antherae 2 ; lemma superius 5-7-nerve ; gluma superior et lemma inferius apice truncata, obtusa vel subacuta :

Anthoecii superi callus truncatus, emarginatus vel bidentatus, 0·4-1 mm. longus.....

b. *Typicae*.

Anthoecii superi callus acutus, pungens, 1-2 mm. longus ..... c. *Pungentes*.

Antherae 3 ; lemma superius plerumque 9-nerve ; gluma superior et lemma inferius plerumque acuta vel setaceo-acuta .....d. *Acuminatae*.

Panicula densissima, spiciformis, 6-14 mm. lata ; rami usque ad 6 mm. longi, 4-1-spiculati.....

e. *Densispicae*.

Gramina annua ; lemma inferius dimidiam partem vel duos trientes spiculae aequans ; aristae 5-12·5 cm. longae. ....f. *Annuae*.

Lemma inferius 5-7-nerve ; lemma superius conspicue bilobum .....II. *Pleioneura*.

Spiculae apice ramorum per triades fasciculatae ; callus emarginatus, bidentatus vel truncatus ; spiculae 6-9 mm. longae ..... III. *Pseudotristachya*.

Lemma inferius 5-7-nerve ; stamina 3 ; callus pungens, 1·5-5 mm. longus ; spiculae 11-36 mm. longae, ternae, binae vel solitariae ..... IV. *Paratristachya*.

\**Anthoecium inferum* sterile, palea nulla ; antherae 2, apicibus minutissime hirsutis ; spiculae 2·2-2·7 cm. longae ; aristae usque ad 17·5 cm. longae..... V. *Lophanthera*.

# ENUMERATION OF SECTIONS AND SUBSECTIONS OF LOUDETIA.

Sect. I. **Eu-Loudetia** C. E. Hubbard, sect. nov. Type : *Loudetia elegans* Hochst. ex A. Br. = *L. simplex* (Nees) C. E. Hubbard.

Subsect. a. **Flammidae** C. E. Hubbard, subsect. nov. Species 2; tropical Africa and tropical South America. Type :—*L. flammida* (Trin.) C. E. Hubbard, comb. nov. (*Arundinella flammida* Trin.).

Subsect. b. **Typicae** C. E. Hubbard, subsect. nov. Species 8 ; tropical and South Africa and Madagascar. Type : *L. elegans* Hochst. ex A. Br. = *L. simplex* (Nees) C. E. Hubbard.

Subsect. c. **Pungentes** C. E. Hubbard, subsect. nov. Species 4 ; tropical and South Africa. Type : *L. Demeusei* (De Wild.) C. E. Hubbard.

Subsect. d. **Acuminatae** C. E. Hubbard, subsect. nov. Species 4; tropical and South Africa. Type : *L. acuminata* (Stapf) C. E. Hubbard.

Subsect. e. **Densispicae** C. E. Hubbard, subsect. nov. Species 4 ; west tropical Africa. Type : *L. densispica* (Rendle) C. E. Hubbard.

Subsect. f. **Annuae** C. E. Hubbard, subsect. nov. Species 3 ; north tropical Africa. Type : *L. hordeiformis* (Stapf) C. E. Hubbard.

Sect. II. **Pleioneura** C. E. Hubbard, sect. nov. Species 2 ; South West Africa. Type : *L. ramosa* (Stapf) C. E. Hubbard, comb. nov. (*Trichopteryx ramosa* Stapf).

Sect. III. **Pseudotristachya** C. E. Hubbard, sect. nov. Species 7 ; west tropical Africa. Type : *L. ternata* (Stapf) C. E. Hubbard.

Sect. IV. **Paratristachya** C. E. Hubbard, sect. nov. Species 5 ; tropical and South Africa. Type : *L. superba* De Not.

Sect. V. **Lophanthera** C. E. Hubbard, sect. nov. Species 1, *L. togoënsis* (Pilger) C. E. Hubbard ; north tropical Africa.

## 5. **Tristachya** Nees, Agrost. Bras. 458 (1829).

Species about 25, in tropical and South Africa, Madagascar and tropical America.

The genus *Tristachya* comprises a number of well-defined sections, a key to which is given below, whilst a more complete account of the African species will be given in the next part of the Flora of Tropical Africa.

## KEY TO THE SECTIONS OF TRISTACHYA.

Pedicelli distincti, 0·5-3 mm. longi ; lemma inferius 3- (raro 5-) nerve ; ovarium glabrum ; triades haud omnino deciduae :

Lemma superius haud transverse barbatum, lobis acutis vel tenuiter acutis muticis :

Glumae glabrae ; callus acutus, pungens ; antherae 3.....

I. *Eu-Tristachya*.



- Glumae setosae; callus oblique truncatus, emarginatus vel bidentatus; antherae 2 ..... II. *Diandrostachya*.  
 Lemma superius infra lobos pilis erectis dense et transverse barbatum, lobis in setam capillarem scaberulam attenuatis; callus obtusus vel truncatus; antherae 3; glumae setosae vel glabrae ..... III. *Dilophotriche*.  
 Pedicelli connati vel fere connati; lemma inferius plerumque 5-9- (raro 3-) nerve; ovarium apice villosum, rarissime glabrum (*T. decora* Stapf); antherae 3:  
 Triades haud omnino deciduae; anthoecii superi callus gracilis, pungens, 1-3.5 mm. longus:  
 Lemmatis superioris lobi acuti vel acuminati, mutici; gluma inferior setulosa vel pilosa ..... IV. *Apochaete*.  
 Lemmatis superioris lobi in setam capillarem scaberulam longam attenuati; gluma inferior glabra vel margines versus setosa ..... V. *Dolichochaete*.  
 Triades facile deciduae; anthoecii superi callus latus, obtusissimus, usque ad 0.6 mm. longus:  
 Lemma superius haud transverse barbatum; spiculae pilis fulvis setosae; ovarium apice pilosum...VI. *Piptostachya*.  
 Lemma superius dorso supra medium fasciculis pilorum transverse barbatum; spiculae pilis albis longis setosae; ovarium glabrum ..... VII. *Zonotriche*.

#### ENUMERATION OF THE SECTIONS OF TRISTACHYA.

Sect. I. **Eu-Tristachya** *C. E. Hubbard*, sect. nov. Species 4; tropical America. Type: *T. leiostachya* Nees.

Sect. II. **Diandrostachya** *C. E. Hubbard*, sect. nov. Species 4; tropical America and west tropical Africa. Type: *T. chrysothrix* Nees.

Sect. III. **Dilophotriche** *C. E. Hubbard*, sect. nov. Species 3; west tropical Africa. Type: *T. tristachyoides* (Trin.) *C. E. Hubbard*

Sect. IV. **Apochaete** *C. E. Hubbard*, sect. nov. Species 3 tropical and South Africa. Type: *T. hispida* (Linn. f.) *K. Schum*

Sect. V. **Dolichochaete** *C. E. Hubbard*, sect. nov. Species 8 tropical and South Africa and Madagascar. Type: *T. Rehmannii* Hack.

Sect. VI. **Piptostachya** *C. E. Hubbard*, sect. nov. Species 1; *T. inamoena* *K. Schum.*; tropical Africa.

Sect. VII. **Zonotriche** *C. E. Hubbard*, sect. nov. Species 1; *T. decora* Stapf; tropical Africa.

6. **Gilgichloa** *Pilger* in Engl. Bot. Jahrb. **51**, 415 (1914). Species 1, *G. indurata* *Pilger*; in Tanganyika Territory.

## New Species from South Africa.

H. G. Schweickerdt & C. E. Hubbard.

**Brachiaria Schoenfelderi** C. E. Hubbard et Schweickerdt sp. nov.; affinis *B. poaeoidi* Stapf, sed panicula lanceolata vel anguste lanceolata, spiculis dense sericeo-villosis differt.

*Gramen* annuum, laxe caespitosum, usque ad 75 cm. altum. *Culmi* plerumque geniculato-adscendentes, graciliusculi, teretes, 3-5-nodes, infra medium ramosi, nodos versus pilis debilibus e tuberculis minutis ortis sparse vel laxe pilosi, ceterum glabri laevesque, internodio summo (pedunculo) longe exserto elongato glabro. *Foliorum vaginae* internodiis breviores, laxiusculae, tenuiter striatae, pilis deciduis e tuberculis minutis ortis laxe pilosae vel inferiores tantum tuberculatae; nodi villosuli; ligulae ad seriem ciliorum densorum redactae; laminae lineares, in acumen gracile attenuatae, usque ad 15 cm. longae et 8 mm. latae, planae, flaccidae, pallide virides, pilis albis e tuberculis minutis ortis laxe vel fere glabrae, marginibus cartilagineis scaberulis saepe undulatis et purpureis. *Panicula* ambitu lanceolata vel anguste lanceolata, subsecunda, laxiuscula, usque ad 15 cm. longa, 2-3.5 cm. lata; axis primarius pubescens vel demum glaber; rami oblique erecti, pubescentes, solitarii, inferiores usque ad 6.5 cm. longi, basin versus per 1-2 cm. nonnunquam nudati, simplices vel inferne ramosi, superiores breviores, simplices vel fere simplices. *Racemi* secundi, densi, usque ad 3.5 cm. longi, simplices vel longiores compositi; rhachis filiformis, subtriquetra, pubescens, circiter 0.25 mm. lata; pedicelli solitarii, brevissimi, appressi, apice discoidci. *Spiculae* biseriatae, densae, imbricatae vel contiguae, ellipticae vel ovato-ellipticae, obtusae, 2-2.5 mm. longae, pallide virides vel purpureo-tinctae, pilis longis argenteo-albis sericeis appressis vel demum patentibus e tuberculis minutissimis ortis denre villosae. *Glumae* valde inaequales; inferior lanceolata, ovata vel irregulariter quadrata, circiter 1 mm. longa, 1-2-nervis vel enervis, tenuiter membranacea, dense et breviter pilosa; superior spiculae aequilonga vel paullo brevior, explanata elliptico-ovata, obtusa, 5-nervis, membranacea, pilis usque ad 1.5 mm. longis praedita. *Anthoecium inferum* vel sterile vel ♂ (?): lemma glumae superiori subsimile sed spiculae aequilongum; palea elliptica, rotundato-obtusa, lemmati fere aequilonga, membranacea, apice marginibusque inflexis pubescentibus vel fere glabris. *Anthoecium superum* ♀, oblongum, rotundato-obtusum, pallidum, usque ad 2 mm. longum, glabrum, nitens, laeve: lemma et palea tenuiter coriacea; antherae 1 mm. longae.

SOUTH WEST AFRICA: Grootfontein, on red soil near Gross Huis, March 1931, *Schoenfelderi* S. 584 (type); black vleis soil, Feb. 1934, *Schoenfelderi* S. 558; Otjikoto, April 1923, *Barnard*; Tsumeb, Nosibpad, April 1934, *Dinter* 7438.

**Rhynchelytrum drakensbergense** C. E. Hubbard et Schweickerdt, sp. nov.; a *R. tomentosum* (Rendle) Stapf et Hubbard, foliorum vaginis

sparse vel laxe pilosis, laminis linearibus brevioribus angustioribus erectis, lemmate inferiore aristato, palea inferiore apice ciliolata distinguendum.

*Gramen* perenne, laxe caespitosum, usque ad 45 cm. altum. *Culmi* erecti vel geniculato-adscendentes, e nodis inferioribus radicantes, graciles, basin versus ramosi, circiter 6-7-nodes, nodos et paniculam versus pubescentes vel pilosi. *Foliorum vaginæ* plerumque internodiis longiores, pilis patentibus e tuberculis minutis ortis sparse vel laxe pilosae; ligulae ad seriem ciliorum densorum redactae; laminae lineares, apice subpungentes, 5-12 cm. longae, 2-5 mm. latae, planae vel siccitate involutae, rigidiusculae, virides vel supra atropurpureae, subtus pilis brevibus e tuberculis minutis ortis praeditae, tenuiter striatae et inter strias asperulae, supra laeves et sparse pilosae vel glabrae. *Panicula* densa, anguste oblonga vel lanceolata, circiter 8 cm. longa et 1.5 cm. lata; rhachis flexuosa, dense et molliter pilosa; rami solitarii, ut rhachis pilosi, usque ad 2.5 cm. longi; pedicelli inaequales, laterales brevissimi, terminales usque ad 2 mm. longi, omnes pilosi et apice pilis albis usque ad 3 mm. longis gerentes. *Spiculae* oblongae vel obovato-oblongae, 2.6-3 mm. longae, villosulae. *Glumae* approximatae; inferior plerumque ad seriem ciliorum brevissimorum redacta, raro ut squama minutissima hyalina evoluta; superior spiculam aequans, explanata late elliptico-oblonga, obtuse et brevissime biloba, firme membranacea, 7-nervis, ciliata, pilis purpureis vel albis appressis dense sericeo-pilosa, aristata, arista usque ad 1.5 mm. longa. *Anthoecium inferum* ♂: lemma glumae superiori subsimile, sed explanatum late oblongum, 5-nerve, arista usque ad 6 mm. longa; palea circiter 2 mm. longa, apice ciliolata. *Anthoecium superum* ♀: lemma explanatum late elliptico-ovatum, 2-2.5 mm. longum, apice ciliolatum, ceterum glabrum, tenuissime 5-nerve; palea lemmate brevior. *Antherae* 1.3-2 mm. longae.

TRANSVAAL: cultivated at the Rietondale Pasture Experiment Station, originally from Sabie Camp, on mountains, April 1935, *Pole Evans and van Rensburg in Nat. Herb. Pretoria* 19797 (type); between Lydenburg and Dullstroom, April 1934, *Pole Evans in Nat. Herb. Pretoria* 19797A.

**Loudetia ramosa** (Stapf) C. E. Hubbard, comb. nov. *Trichopteryx ramosa* Stapf in Kew Bull. 1897, 298.

*Distr.* South West Africa.

**Loudetia anomala** C. E. Hubbard et Schweickhardt, sp. nov.; affinis *L. ramosae* (Stapf) C. E. Hubbard, sed culmis altioribus simplicibus, foliorum laminis latioribus, panicula majore laxa, anthoecii superi lemmate laxo piloso differt.

*Gramen* perenne (?); basis ignota. *Culmi* graciliusculi, 60 cm. (vel ultra) longi, rigidi, simplices, 6-nodes, glabri, laeves. *Foliorum vaginæ* internodiis longiores, marginibus superne pilosae et ore laxo barbatae, ceterum glabrae, laeves; ligulae ad seriem ciliorum

densorum redactae ; laminae lineares, in acumen setaceum attenuatae, usque ad 20 cm. (vel ultra) longae et 7 mm. latae, planae, glabrae vel supra sparse pilosae, marginibus scaberulis exceptis laeves. *Panicula* laxa, 20–25 cm. longa, usque ad 9 cm. lata ; rhachis glabra, laevis vel leviter scaberula ; rami filiformes, erecti vel adscendentes, plerumque 2–4-nati, laxe divisi, marginibus scaberuli, usque ad 12.5 cm. longi ; pedicelli inaequales, laterales usque ad 3 mm. longi, terminales usque ad 8 mm. longi. *Spiculae* lanceolatae vel oblongae, 6–9 mm. longae, pallidae et plus minusve purpureo-suffusae. *Glumae* tenuiter chartaceae, glabrae, 3-nerves vel superior 5-nervis ; inferior ovata, tenuiter acuta, 4.5–6 mm. longa, nervis minute scaberulis ; superior lanceolata vel anguste ovata, acuta, spiculae aequilonga. *Anthoecium inferum* ♂ : lemma oblongo-ovatum, acutum, usque ad 7 mm. longum, 5–7-nerve, glabrum ; palea anguste oblonga, 5–6 mm. longa, membranacea, carinis angustissime alatis et sparse ciliolatis vel glabris. *Anthoecium superum* lanceolatum, ♀ : callus rotundato-truncatus, circiter 0.6 mm. longus, pilis usque ad 3 mm. longis barbatus ; lemma tenuiter coriaceum, 6 mm. longum, tenuiter 9–11-nerve, laxe pilosum, 2-lobum, lobis acutis 1–4-nervibus usque ad 3 mm. longis ; arista circiter 10 mm. longa, columna 3 mm. longa ; palea lineari-lanceolata, usque ad 5.5 mm. longa, membranacea, carinis superne incrassatis. *Antherae* 3, 3–4 mm. longae.

SOUTH WEST AFRICA : Damaraland ; Auros, near Grootfontein, on dolomitic soil, *Schoenfelder* 892 (Type in Nat. Herb. Pretoria, no. 19710).

***Cymbopogon Dieterlenii* Stapf** ex Phillips in Ann. S. Afr. Mus. 16, 336 (1917), pro syn., nomen tantum. Descriptio hic addita auctore H. G. Schweickerdt. Affinis *C. marginato* (Steud.) Stapf sed foliorum laminis multo angustioribus, ligulis multo longioribus, rhacheos internodiis et pedicellis pilis brevioribus ciliatis distinguitur.

*Gramen* perenne, compacte caespitosum, innovationibus intra-vaginalibus numerosis, usque ad 50–100 cm. altum. *Culmi* erecti, subvalidi, infra inflorescentiam simplices, 2–4-nodes, teretes, glabri. *Foliorum* basalium vaginae usque ad 12 cm. longae, firmae, striatae, basin versus latae et inter strias sparse et appresse pubescentes, sursum attenuatae et glabrae, persistentes, leviter tortae, eae culmorum virescentes, striatae, glabrae, nonnunquam tortae, fere laxae ; ligulae submembranaceae vel hyalinae, lanceolatae, usque ad 12 mm. longae ; laminae conduplicatae, angustissime lineares, basin versus semiteretes, supra concavae, sursum longe filiforme attenuatae, ad 40 cm. longae, explanatae 1.5–2.5 mm. latae, glaucescentes, nervis primariis utrinque 3 prominentibus, facie et dorso glabrae, margine minutissime scabrae. *Panicula* spathata, compacta, continua vel interrupta, 7–15 (raro 20) cm. longa, circiter 2–3.5 cm. lata ; axis primarius 3–4-nodis, internodio inferiore 8–12 cm. longo, ceteris sursum multo brevioribus ; ramus primarius infimus usque ad 5.5 cm. longus, vix exsertus, axis primarii

internodio plerumque brevior ; rami sequentes e basi in radios 2-3 divisi ; radii semiteretes, filiformes, 4-12 mm. longi, simplices, glabri vel pubescentes, vaginis spathoideis subtendentibus plus minusve inclusi ; spatheolae anguste lanceolatae, 2-3 cm. longae, rubescentes, submembranaceae, elaminatae, glabrae, striatae, marginibus membranaceis ; pedunculi 4-10 mm. longi, glabri vel pubescentes, nodo barbato. *Racemi* 2-nati, demum divaricati, 1.5-2 cm. longi, villosuli, alter sessilis, alter basi internodio gracili fere 2 mm. longo suffultus ; rhacheos internodia inferiora in spiculas fertiles apice in cupulam obliquam dentatam ampliata, cetera sursum leviter dilatata, apice truncata, apice et secus angulos albo-villosa, villis lateralibus 1.75 mm. longis. *Spiculae fertiles* oblanceolatae, 5.5 mm. longae ; callus brevissimus, barbatus ; glumae subaequilongae ; inferior glabra, bicarinata, carinis supra medium late alatis, inter carinas 3-5-nervis ; alae irregulariter dentatae et minutissime ciliolatae ; superior navicularis, 1-nervis, lanceolata, margine membranacea et ciliata, carina alata et minutissime ciliolata ; anthoecium inferius ad lemma hyalinum 2-3-nerve oblongum ciliatum 4 mm. longum redactum ; anthoecii superi lemma 4.5 mm. longum, usque ad medium bifidum, membranaceum, lobis anguste lanceolatis ciliatisque ; arista 10.5 mm. longa, columna 6.5 mm. longa glabra ; antherae 2-3 mm. longae ; lodiculae 2, plus minusve 0.5 mm. longae. *Spiculae pedicellatae* ♂, 5 mm. longae, lanceolatae, glabrae ; pedicelli 2 mm. longi, compressi, marginibus pilis 1.75 mm. longis ciliatis ; gluma inferior bicarinata, carinis et marginibus ciliatis, inter carinas 7-9-nervis, superior paulo brevior atque 1-3-nervis, marginibus ciliatis ; lemma hyalinum, 3.5 mm. longum, oblanceolatum, 5-nerve, marginibus sursum ciliatum ; antherae 3 mm. longae ; lodiculae 2, plus minusve 0.5 mm. longae. *Andropogon Dieterlenii* Stapf ex Phillips in Ann. S. Afr. Mus. **16**, 336 (1917), nomen.

SOUTH AFRICA : Basutoland, Leribe, mountain slopes and veld, autumn, *Dieterlen* 390 (type).

A description of the above species apparently was never published. In order to validate this name a description has now been drawn up on basis of the material in Herb. Kew, which had been examined and written up by Stapf.

### **Oryzidium, a New Genus from South West Africa.**

C. E. Hubbard & H. G. Schweickhardt.

**Oryzidium** C. E. Hubbard et Schweickhardt, gen. nov. e tribu *Panicarum* ; distinguitur spiculis adaxialibus in ramis paniculae ortis cum pedicellis continuis, pedicellis demum basi disarticulantibus, gluma inferiore plerumque parva, gluma superiore spiculae aequilonga longiaristata, rhachilla inter anthoecia applanata leviter elongata supra anthoecium superum nonnunquam minute producta.

*Spiculae* omnes similes, lanceolatae, acute acuminatae, aristatae, dorso compressae, solitariae, pedicellatae, adaxiales, cum pedicellis

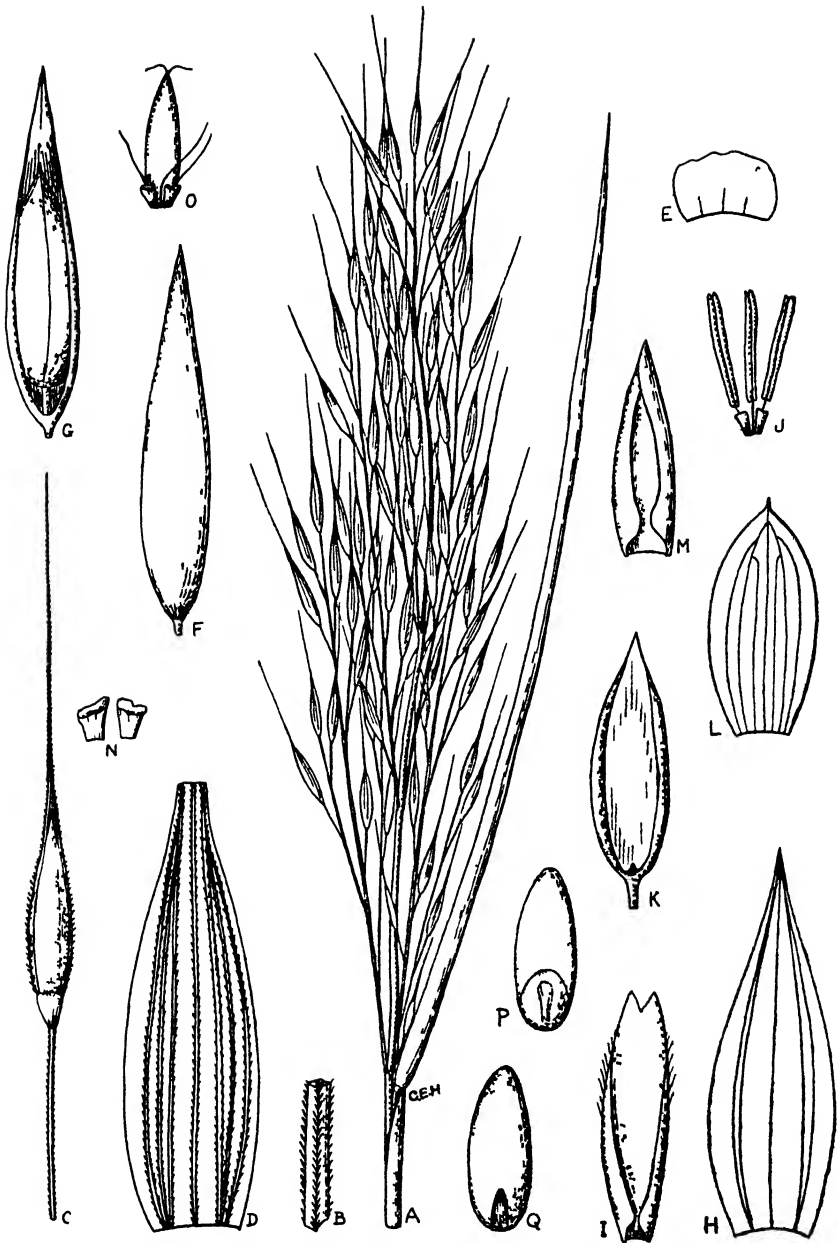


Fig 2 *Oryzidium Barnardii* C E Hubbard et Schweickerdt A, inflorescence and uppermost leaf, B portion of branch of inflorescence, C spikelet and pedicel,  $\times 3$ ; D upper glume (awn removed),  $\times 6$ , E, lower glume,  $\times 6$ , F, lower floret, from back,  $\times 6$ , G, lower and upper florets,  $\times 6$ , H lemma of lower floret  $\times 6$ , I palea of lower floret  $\times 6$ , J, male flower,  $\times 5$ , K, upper floret and internode of rhachilla,  $\times 6$ , L, lemma of upper floret,  $\times 6$ , M, palea of upper floret,  $\times 6$ , N lodicules enlarged, O, lodicules, filaments and immature caryopsis, enlarged, P, Q, caryopsis,  $\times 6$

continuae, pedicellis demum basi disarticulantibus, in ramis angulatis paniculae ortae; rhachilla inter anthoecia applanata, leviter elongata, continua, supra anthoecium superum nonnunquam minute producta. *Anthoecia* duo; inferum ♂; superum ♀, infero brevius. *Glumae* valde dissimiles; inferior plerumque parva, membranacea, marginibus hyalinis, enervis vel 3-nervis; superior spiculae aequilonga, explanata lanceolato- vel elliptico-oblonga, acuminata, arista longa stricta rigida scaberula terminata, prominenter 7-nervis, inter nervos firma. *Anthoecium inferum*: lemma gluma superiore brevius, lanceolatum, acutum, explanatum late lanceolatum, firmum, tenuiter 5-nerve; palea lemmate brevior, oblonga, minute bifida, bicarinata, hyalina, inter carinas plana. *Anthoecium superum* stipitatum, oblongum, acuminatum: lemma explanatum oblongo-ellipticum, mucronulatum, tenuiter coriaceum, marginibus firmis angustis incurvis, tenuiter 7-nerve; palea ovato-lanceolata, acuta, lemmati aequilonga, dorso plana, tenuiter coriacea, 2-nervis. *Lodiculae* 2, carnosae, cuneatae. *Stamina* 3; antherae oblongo-lineares. *Ovarium* stipitatum, anguste ovoideum, glabrum; styli distincti. *Caryopsis* oblonga, dorso valde compressa, inter lemma et paleam arcte inclusa; scutellum circiter tertiam partem caryopsidis aequans; hilum oblongum, parvum.

*Gramen* aquaticum (?); foliorum laminae lineares, planae; ligulae brevissimae, ciliatae; paniculae rami demum de rhachi disarticulantes.

Species 1, Africae meridionalis incola.

***Oryzidium Barnardii*** C. E. Hubbard et Schweickhardt, sp. nov. *Gramen* perenne (?), 90–120 cm. altum; basis ignota. *Culmi* paniculam versus tenuiter striati, teretes, graciliusculi, glabri, laeves. *Folia* summa glabra; vaginae striatae, laeves; ligulae ad seriem ciliorum circiter 1–2 mm. longorum redactae; laminae usque ad 30 cm. (vel ultra) longae et 0.8 cm. latae, flaccidae, marginibus scabrido-serratis exceptis laeves, tenuiter nervosae. *Panicula* angusta oblonga, circiter 25 cm. longa et 3–4 cm. lata, contracta, erecta; rhachis inferne teres et laevis, apicem versus angulata et scabrida; rami gracillimi, suberecti, angulis valde scabri, fasciculati vel solitarii, divisi, ramulis erectis, inferiores 10–15 cm. longi; pedicelli angulati, scabridi, 0.5–1.5 cm. longi. *Spiculae* erectae, circiter 9–10 mm. longae, pallide virides. *Gluma inferior* late oblata vel late ovata, obtusa, 1–2 mm. longa, raro lanceolata, acuta, mucronata et usque ad 5 mm. longa, laevis vel minute asperula; gluma superior nervis scabra, arista 10–18 mm. longa. *Anthoecium inferum*: lemma 8–9 mm. longum, laeve, glabrum; palea 5–5.5 mm. longa, carinis ciliolata; antherae circiter 3 mm. longae. *Anthoecium superum* stipite circiter 1 mm. longa praeditum: lemma 5 mm. longum, glabrum, laeve; palea 5 mm. longa; caryopsis 3–3.5 mm. longa, pallida.

SOUTH WEST AFRICA: Ovamboland; Tamansu, in vleis, March–April 1923, Barnard.

*Oryzidium* is not closely related to any genus at present known from the African continent. It bears a slight superficial resemblance to some long-awned species of *Echinochloa* Beauv., but may be readily distinguished by the different kind of inflorescence, elongated pedicels which are continuous with the adaxial spikelets, long-awned upper glume, awnless lower lemma, and by the elongated rhachilla-internode between the lower and upper florets. Amongst extra-african plants, our new genus probably shows closest affinity with *Chaetium* Nees, a tropical American genus of which the area of distribution extends from Mexico to Brazil. *Chaetium* differs, however, by the presence of a distinct callus-like base to the spikelets, the persistent pedicels, long-awned lower glume, sterile lower floret reduced to the short-awned lemma and by the absence of a definite internode between the florets. The material of *Oryzidium* at present available is rather meagre, but there is sufficient to obtain a clear idea of the structure of the spikelets, although it is insufficient to give a complete specific description.

## A New Genus from North East Africa.

C. E. Hubbard.

**Phaenanthoecium** C. E. Hubbard, gen. nov.; a *Danthonia* D.C., culmis decumbentibus vel adscendibus multinodibus plerumque multiramosis, foliorum laminis brevibus horizontaliter patentibus, glumis plerumque oblongis emarginatis vel bilobis, gluma inferiore 1-3-nervi, anthoeciis e glumis longe exsertis distinguendum.

*Spiculae* anguste oblongae, a latere leviter compressae, aristatae, in racemis angustis breviter pedicellatae; rhachilla supra glumas et inter anthoecia disarticulans, internodiis gracilibus glabris. *Anthoecia* 5-9, ♂ vel summa redacta, e glumis exserta. *Glumae* persistentes, angustae oblongae vel elliptico-oblongae, obtuse bilobae, emarginatae vel obtusae, leviter inaequales, membranaceae; inferior 1-3-nervis, dorso rotundata vel carinata; superior 3-4-nervis, dorso rotundata. *Lemmata* e glumis exserta, angusta, acuminata, dorso rotundata, membranacea, marginibus angustis hyalinis, 9-nerve, breviter biloba, lobis in setam tenuem longam attenuatis, e sinu loborum aristata; arista geniculata, columna torta; callus brevissimus, truncato-obtusius, barbatus. *Paleae* lineari-oblongae, obtusae vel truncatae, bicarinatae, membranaceae. *Lodiculae* duae, cuneatae, minutae, ciliolatae. *Stamina* tria. *Ovarium* glabrum; styli distincti, terminales; stigmata breviter plumosa, ex anthoeciis lateraliter exserta. *Caryopsis* lineari-oblonga, concavo-convexa, inter lemma paleamque laxè inclusa; embryo quadrantem singulum caryopsidis aequans.

*Gramina* perennia; culmi decumbentes vel adscendentes, nonnunquam valde elongati, multinodes, plerumque multiramosi, graciles; laminae anguste lineares, planae vel convolutae; ligulae ad seriem cilliorum redactae; racemi paucispiculati.

Species 1, montium Africae boreali-orientalis incola.



**Phaenanthoecium Köstlinii** (Hochst.) C. E. Hubbard, comb. nov.  
*Danthonia Köstlinii* Hochst. ex A. Rich. Tent. Fl. Abyss. 2, 421 (1851); Steud. Syn. Pl. Plum. 1, 245 (1854). *Streblochaete Köstlinii* Hochst. in Schimper, Iter. Abyss., sect. secunda, sub no. 683 (1843), nomen. *S. Schimperii* Hochst. ex Steud. Syn. Pl. Glum. 1, 245 (1854), in syn.

SUDAN : Darfur ; Jebel Marra, above waterfall, 2460 m., hanging down rock-faces by cascade, just out of reach of spray, *Lynes* 44.

ERITREA : Ocule Cusai ; Soyra Mtns., Mt. Cocaia, 2700–2880 m., *Pappi* 1337 : Scimezana ; Guna-Guna, 2190 m., *Pappi* 674 (ex Chiov. in Ann. Istit. Bot. Roma, 8, 344 : 1908).

ABYSSINIA : Tigre ; Mt. Scholoda, 1837, *Schimper* 412 ; Mettaro, 2400 m., 1862, *Schimper* 323.

According to *Lynes* this grass hangs down in long trails 6 to 7 ft. in length.

The genus *Streblochaete* Hochst. was proposed by Hochstetter for *S. nutans* Hochst. and *S. Köstlinii* Hochst., on printed labels issued with Schimper iter Abyssinicum, Sect. secunda, no. 683 (c. 1843). No generic or specific descriptions were given. Later the two species were referred to other genera by A. Richard (Tent. Fl. Abyss. 2 : 1851), *S. nutans* to *Trisetum* (p. 417), and *S. Köstlinii* to *Danthonia* (p. 421). Steudel (Syn. Pl. Glum. 1, 245 : 1854) included both species under *Danthonia* and they have been retained in this genus by most authors. In 1906 Pilger (Engl. Bot. Jahrb. 37, Beibl. no. 85, 61) quite rightly recognised *Streblochaete* Hochst. as a genus distinct from *Danthonia* and supplied a short generic description. He limited the genus to one species, *Streblochaete nutans* Hochst. (= *S. longiaristum* (A. Rich.) Pilger) and retained *S. Köstlinii* in *Danthonia*. *Streblochaete* has a fairly wide distribution in tropical Africa, occurring in the west on the Cameroons Mountain and in the east on mountains from Abyssinia southwards to Nyasaland. It is also known from Réunion, Java and the Philippine Islands. The Javanese plant was described as a new genus *Koordersiochloa* by Merrill (Philipp. Journ. Sci., Bot. 12, 67, t.1 : 1917) and the Réunion plant as a new genus *Pseudostreptogyne* by A. Camus (Bull. Soc. Bot. France, 57, 476, figs. 1–13 : 1930). *Streblochaete* may be distinguished from *Phaenanthoecium* by the following characters :—the paniculate inflorescence ; membranous ligule ; herbaceous glumes and lemmas, the latter entire or shortly 2-lobed with the lobes obtuse or acute ; the slender coiled and entangled awns, each of which is inserted on the back of the lemma below the sinus of the two lobes or entire tip.

### The Species of *Helictotrichon* in Tropical Africa.

C. E. Hubbard.

***Helictotrichon angustum*** C. E. Hubbard, sp. nov. ; affine *H. umbroso* (Hochst.) C. E. Hubbard, spiculis longioribus 3–5-floris, rhachillae internodiis usque ad 2 mm. longis, lemmatibus brevioribus 5-nervibus, arista triente superiore lemmatis orta differt.

*Gramen* perenne caespitosum, circiter 60 cm. altum. *Culmi* erecti, graciles, simplices, 2-nodes, glabri, laeves. *Foliorum vaginae* angustae, internodiis breviores, inferiores minute pubescentes vel glabrae, laeves; ligulae oblongae, laceratae, usque ad 2 mm. longae; laminae anguste lineares, in acumen tenue attenuatae, usque ad 15 cm. longae, 1-2.5 mm. latae, planae, erectae, glabrae, subtus laeves, supra tenuiter scaberulae. *Panicula* linearis vel lineari-lanceolata, contracta, interrupta, leviter nutans, 14-20 cm. longa, 1.2-2.5 cm. lata; rhachis gracillima, inferne laevis; rami 2-3-nati, erecti, paucispiculati, simplices vel sparse divisi, filiformes, scaberuli, inferiores usque ad 5 cm. longi; pedicelli laterales 2-3 mm. longi, terminales elongati. *Spiculae* anguste oblongae, 10-14 mm. longae, pallide virides, appressae. *Glumae* tenuiter acutae, mucronatae, carina superne scaberulae, marginibus et apice hyalinis; inferior lanceolata, 5.5-6 mm. longa, 1-nervis; superior anguste oblongo-lanceolata, 7.5-9 mm. longa, 3-nervis. *Anthoecia* 3-5: rhachillae internodia usque ad 2 mm. longa, pilis usque ad 2 mm. longis pilosa; callus obtusus, brevissimus, breviter barbatus. *Lemmata* exserta, a latere visa anguste lanceolata et setaceo-acuminata, 6-7.5 mm. longa (inferiora), coriacea, marginibus angustis et apice hyalinis, 5-nervia, superne scabrida, apice biloba, lobis setam tenuem usque ad 3 mm. longam gerentibus; arista triente superiore lemmatis orta, geniculata, 10-16 mm. longa, columna 3-5 mm. longa. *Paleae* oblongo-lineares, 6-6.5 mm. longae, carinis superne ciliolatis. *Antherae* 1.5-2 mm. longae. *Ovarium* apice hispidulum.

KENYA COLONY: Ngong Hills, in red loam, 2100-2400 m., Edwards 2960.

***Helictotrichon cartilagineum*** C. E. Hubbard, sp. nov.; ab *H. elongato* (Hochst.) C. E. Hubbard, glumis firme membranaceis marginibus scariosis longioribus, lemmatibus cartilagineis longioribus fere laevibus vel minute granulosis distinguendum.

*Gramen* perenne caespitosum, usque ad 1.3 m. altum. *Culmi* erecti vel basi geniculati, graciles vel validiusculi, simplices, 2-4-nodes, glabri, laeves. *Foliorum vaginae* striatae, glabrae, raro inferiores sparse pilosi, laeves vel laminam versus asperulae; ligulae truncatae, circiter 2 mm. longae; laminae lineares, acutae, usque ad 30 cm. longae, 2-4 mm. latae, planae, glabrae, raro laxe pilosae, supra nervis scaberulae, vel laeves. *Panicula* angusta, 10-38 cm. longa, 1.2-3.8 cm. lata, contracta, moderate densa vel plus minusve interrupta; rhachis apicem versus scabrida; rami bini, filiformes, laxe divisi, scabridi, inferiores usque ad 15 cm. longi; pedicelli laterales 1-3 mm. longi. *Spiculae* oblongae, 10-14 mm. longae, pallide virides vel purpureae. *Glumae* firme membranaceae, marginibus scariosis, carina scaberulae; inferior oblongo-lanceolata vel oblonga, acuta, 6.5-10 mm. longa, 2-3-nervis; superior elliptico-oblonga vel oblonga, tenuiter acuta, 9-13 mm. longa, 3-5-nervis. *Anthoecia* 3; rhachillae internodia 2-3 mm. longa, pilis 2-3 mm. longis barbata; callus brevissimus, obtusus, breviter barbatus.

*Lemmata* vel glumam superiorem non superantia vel ex hac breviter exserta, a latere visa lanceolato-oblonga acuta, 8·5–12 mm. longa (inferiora), rigidissimi, apice scarioso excepto cartilaginea, glabra, minute granulosa vel fere laevia, prominenter 7-nervia, breviter biloba, lobis acutis angustis et in setam brevem abeuntibus; arista prope medium lemma orta, geniculata, usque ad 2 cm. longa, columna 4–6 mm. longa. *Paleae* lineari-oblongae, 6–7·5 mm. longae, carinis superne rigide ciliolatis. *Antherae* 2–3·5 mm. longae. *Ovarium* hispidulum.

KENYA COLONY: Timboroa, in grassland, *Hitchcock* 25055; near Timboroa, in grassland, *Hitchcock* 25064; Kipkapus, in grassland, *Hitchcock* 25046; neighbourhood of Nyeri, Leikipia Plateau and Aberdare Range, *Routledge*; Mt. Kenya, 3000 m., *Lyne Watt* 1111; Kinangop, 2100 m., *Turner* 1578 (type); Ngong Hills, 2100–2400 m., *Edwards* 2961; Escarpment, *Linton* 185.

***Helictotrichon Maitlandii* C. E. Hubbard**, sp. nov.; affine *H. rigidulo* (Pilger) C. E. Hubbard, a quo foliorum laminis latoribus, panícula lineari angustiore, spiculis paullo longioribus, gluma superiore brevior, rhachillae internodiis longioribus differt.

*Gramen* perenne, usque ad 1·2 m. altum. *Culmi* erecti vel leviter geniculati, moderate validi, simplices, 3–5-nodes, glabri, laeves. *Foliorum vaginæ* internodiis longiores, striatae, inferiores inferne pubescentes, ceterae glabrae, laeves; ligulae truncatae, usque ad 2·5 mm. longae; laminae lineares, acutae, usque ad 30 cm. longae, 4·5–6 mm. latae, planae, firmae, supra sparse pubescentes vel glabrae, nervis scaberulae vel fere laeves. *Panicula* linearis, contracta, usque ad 35 cm. longa, circiter 1·3 cm. lata; rhachis superne scaberula; rami erecti, bini, inaequales, gracillimi, scaberuli, inferiores usque ad 10 cm. longi; pedicelli laterales 2–3 mm. longi. *Spiculae* oblongae, 14–16 mm. longae, pallide virides. *Glumae* tenuiter acutae, herbaceae, marginibus et apice scariosis, nervis minute scaberulis; inferior oblongo-lanceolata, 7·5–9 mm. longa, 3-nervis; superior oblongo-lanceolata vel anguste elliptico-oblonga, 8·5–11 mm. longa, 4–5-nervis. *Anthoecia* 2–3; rhachillae internodia 3–4 mm. longa, pilis usque ad 2 mm. longis laxè pilosa; callus brevissimus, obtusus. *Lemmata* exserta, a latere visa anguste lanceolata, setacco-acuta, circiter 10 mm. longa (inferiora), coriacea, 7–9-nervia, superne minute granulosa, biloba, lobis tenuiter acutis et in setam brevem abeuntibus; arista inter medium et partem trientem superiorem lemmatis orta, usque ad 2 cm. longa, columna 4–5 mm. longa. *Paleae* oblongo-lineares, usque ad 9 mm. longae, carinis superne rigide ciliolatis. *Antherae* 3 mm. longae. *Ovarium* supra medium minute hispidulum.

SOUTHERN NIGERIA: Bamenda, Lakom, on grass-covered plateau, 2100 m., *Maitland* 9A.

***Helictotrichon phaneroneuron* C. E. Hubbard**, sp. nov.; ab *H. elongato* (Hochst.) C. E. Hubbard, foliorum vaginis inferioribus

dense pubescentibus, panicula laxa latiore, pedicellis lateralibus longioribus, spiculis paullo longioribus, glumis angustioribus distinguendum.

*Gramen* perenne, laxe caespitosum, usque ad 1·2 m. altum. *Culmi* erecti vel basi leviter geniculati, graciles, simplices, 2-nodes, glabri, laeves. *Foliorum vaginae* striatae, inferiores dense pubescentes, internodiis longiores, ceterae sparse puberulae vel glabrae, laeves, internodiis breviores; ligulae truncatae, circiter 2 mm. longae; laminae lineares, acutae, usque ad 15 cm. longae, 2-3 mm. latae, planae, puberulae vel dense pubescentes. *Panicula* oblonga, laxa, 12-20 cm. longa, usque ad 5·5 cm. lata; rhachis superne scaberula et flexuosa; rami 2-4-nati, filiformes, flexuosi, 4-1-spiculati, scabridi, apicem versus minute hispiduli, inferiores usque ad 5·5 cm. longi; pedicelli laterales 4-14 mm. longi. *Spiculae* oblongae, 11-14 mm. longae, pallide virides. *Glumae* membranaceae, laeves, vel carina scaberulae, tenui- vel setaceo-acutae; inferior lineari-lanceolata vel anguste lanceolata, 6-9 mm. longa, 1-nervis; superior anguste oblanceolata, 8-10 mm. longa, 3-nervis. *Anthoecia* 3; rhachillae internodia 2·5-3 mm. longa, pilis usque ad 3 mm. longis dense barbata; callus brevissimus, obtusus. *Lemmata* breviter exserta, a latere visa oblongo-lanceolata, acuta, 8-10 mm. longa (inferiora), breviter biloba, lobis acutis setam brevissimam gerentibus, apice scariosa, ceterum firma, 7-9-nervia, siccitate striata, scaberula; arista supra medium lemma orta, geniculata, usque ad 18 mm. longa, columna 4-5 mm. longa. *Paleae* lineari-oblanceolatae, 9 mm. longae, carinis supra medium rigide ciliolatae. *Antherae* 5 mm. longae. *Ovarium* apice hispidulum.

TANGANYIKA TERRITORY: Iringa District; Msima Stock Farm, common in vleis, *Emson* 348 (type); East Ubena; Ukinga-Upangwa, *Hill* H3-30-27.

**Helictotrichon Friesiorum** (Pilger) C. E. Hubbard, stat. nov. *Avenastrum elongatum* var. *Friesiorum* Pilger in Notizbl. Bot. Gart. Berlin, 9, 517 (1926).—Affine *H. umbroso* (Hochst.) C. E. Hubbard, sed spiculis et lemmatibus longioribus, rhachillae internodiis paullo longioribus et pilis longioribus barbatis differt.

*Gramen* perenne, circiter 75 cm. altum. *Culmi* e basi geniculata erecti, graciles, simplices, 2-nodes, glabri laevesque; internodia superiora exserta. *Foliorum vaginae* striatae, laeves, inferiores pubescentes, ceterae glabrae; ligulae truncatae, usque ad 2 mm. longae; laminae anguste lineares, apice subacutae, usque ad 15 cm. longae, convolutae vel planae, usque ad 2·5 mm. latae, rigidiusculae, laeves, supra sparse pubescentes, subtus glabrae. *Panicula* angusta, erecta, contracta, 10-20 cm. longa, 1·2-1·8 cm. lata; rhachis superne scaberula; rami plerumque bini, erecti vel leviter patentes, filiformes, scaberuli, 1-3-spiculati, inferiores usque ad 6·5 cm. longi; pedicelli laterales circiter 1 mm. longi. *Spiculae* anguste oblongae, 13-16 mm. longae, pallide virides vel purpureo-tinctae. *Glumae* acutae, hyalinae, carina apicem versus scaberulae; inferior

anguste lanceolata, 5–7 mm. longa, 1-sub 3-nervis; superior oblongo-lanceolata, 8–9 mm. longa, 3-nervis. *Anthoecia* 2–3; rhachillae internodia 3–4 mm. longa, apicem versus pilis usque ad 3 mm. longis laxe barbata; callus obtusus, circiter 1 mm. longus, breviter barbatus. *Lemmata* conspicue exserta, a latere visa oblongo-lanceolata, tenuiter acuta, 10–12 mm. longa (inferiora), coriacea, minute granulosa, glabra, 7-nervia, breviter biloba, lobis setaceo-acutis; arista infra medium lemma orta, geniculata, 16–20 mm. longa, columna 6–7 mm. longa. *Paleae* oblongo-lineares, 7–8 mm. longae, carinis superne rigide ciliolatis. *Antherae* 2 mm. longae. *Ovarium* apice hispidulum.

KENYA COLONY: Mt. Kenya, Forest Station, 2300 m., *Fries*, 697 (type), 818.

***Helictotrichon milanjanum* (Rendle) C. E. Hubbard**, comb. nov. *Bromus milanjanus* Rendle in Trans. Linn. Soc., Ser. 2, 4. 59 (1894).

*Distr.* Kenya Colony, Uganda, Tanganyika Territory, Belgian Congo, Nyasaland; on mountains, 2100–3300 m.

***Helictotrichon umbrosum* (Hochst.) C. E. Hubbard**, comb. nov. *Trisetum umbrosum* Hochst. ex Steud. Syn. Pl. Glum 1, 227 (1854). *T. biflorum* Hochst. in Flora, 38, 275 (1855). *Avenastrum umbrosum* (Hochst) Pilger in Notizbl. Bot. Gart. Berlin, 9, 521 (1926), in obs.

*Distr.* Abyssinia: near Debra Eski, 2790 m., 1850, *Schimper* 179! without precise locality, 1852, *Schimper* 960!

***Helictotrichon umbrosum* var. *micrantherum* C. E. Hubbard**, var. nov.; a typo differt, culmis basin versus 2-nodibus, foliorum vaginis glabris, laminis convolutis glabris, panícula 20–25 cm. longa, spiculis usque ad 13 mm. longis, gluma inferiore usque ad 6.5 mm. longa 1-nervi, gluma superiore usque ad 9 mm. longa, rhachillae internodiis 3.5 mm. longis, lemmatibus inferioribus usque ad 10 mm. longis laevibus, aristae columna 5–6 mm. longa, antheris 0.6–1 mm. longis.

TANGANYIKA TERRITORY: Mt. Kilimanjaro, Peters Hut, 3750 m., *Hitchcock* 24639.

This variety has the appearance of possessing cleistogamous florets, as the very small burst anthers were found entangled amongst the hairs of the loosely plumose stigmas.

***Helictotrichon Mannii* (Pilger) C. E. Hubbard**, comb. nov. *Avenastrum Mannii* Pilger in Notizbl. Bot. Gart. Berlin, 9, 520 (1926).

*Distr.* Cameroons Mtn., 1800–3000 m.; Fernando Po, 2100–3000 m.

***Helictotrichon Newtonii* (Stapf) C. E. Hubbard**, comb. nov. *Avena Newtonii* Stapf in Kew Bull. 1897, 291.

*Distr.* Angola.

**Helictotrichon rigidulum** (Pilger) C. E. Hubbard, comb. nov.  
*Avenastrum rigidulum* Pilger in Notizbl. Bot. Gart. Berlin, 9, 519 (1926).

*Distr.* Cameroons Mtn., in grassland, 2010-3000 m.

**Helictotrichon elongatum** (Hochst.) C. E. Hubbard, comb. nov.  
*Danthonia elongata* Hochst. ex A. Rich. Tent. Fl. Abyss. 2, 419 (1851). *Trisetum Neesii* Hochst. ex Steud. Syn. Pl. Glum. 1, 227 (1854). *Avena festucaeformis* Hochst. in Flora, 38, 275 (1855). *A. muriculata* Stapf in Kew Bull. 1897, 291. *Avenastrum elongatum* (Hochst.) Pilger in Notizbl. Bot. Gart. Berlin, 9, 518 (1926). *A quinquenerve* Stent et J. M. Rattray in Proc. Rhod. Sci. Assoc. 32, 42 (1933).

*Distr.* Eritrea, Abyssinia, Kenya Colony, Uganda, Tanganyika Territory, Nyasaland and Southern Rhodesia.

**Helictotrichon lachnanthum** (Hochst.) C. E. Hubbard, comb. nov. *Trisetum lachnanthum* Hochst. ex A. Rich. Tent. Fl. Abyss. 2, 416 (1851). *Avena lachnantha* (Hochst.) Hook. f. in Journ. Linn. Soc., Bot. 7, 229 (1864), excl. specim. *A. Rothii* Stapf in Kew Bull. 1897, 292. *Avenastrum lachnanthum* Pilger in Notizbl. Bot. Gart. Berlin, 9, 521 (1926).

*Distr.* Abyssinia, Kenya Colony, Uganda and Tanganyika Territory.

**Avenastrum flabellatum** A. Peter in Fedde, Repert., Beih. 40, 1. Anhang, 98 (1930).

TANGANYIKA TERRITORY: Uvinsa, east of Lugufu, Peter 36642 (type), 46153.

An examination of the type specimen, which was kindly lent to Dr. Schweickerdt, indicates that it is not a species of *Helictotrichon* (*Avenastrum*) but rather a species of *Diplachne* or a closely allied genus. It is related to *Diplachne biflora* Hack. and represents the same species as the following specimens in the Kew Herbarium:—Tanganyika Territory: N. Mpwapwa, 1500 m., Staples 469; Mpwapwa, Kibariana Mtn., 1650 m., Burt 3952; Mbeya District, Unyamwanya, 1500 m., Davies 182; Mbosi, 1200 m., Davies 610; Kyimbila, Stolz 2570. Northern Rhodesia: on Abercorn—Mbosi road, 1560 m., St. Clair-Thompson 1114. The biseriate arrangement of the spikelets, 1-nerved upper glume, 3-nerved bearded lemmas, smaller paleas and non-geniculate awns are characters which serve to distinguish it from *Helictotrichon*.

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### XXXIII—MISCELLANEOUS NOTES.

**Birthday Honours.**—We have much pleasure in recording the conferment of the following Honours: a Knighthood on PROF. A. C. SEWARD, F.R.S.; C.I.E. on DR. F. J. F. SHAW, Director of

the Institute of Agricultural Research, and Imperial Economic Botanist, India ; C.V.O. on MR. W. J. BEAN, late Curator of the Royal Botanic Gardens, Kew ; C.B.E. on MR. R. W. THORNTON, Director of Agriculture, Basutoland ; O.B.E. on MR. E. H. F. HAVELOCK, Secretary, Development Commission and Administration Secretary, Agricultural Research Council, and on MR. G. F. CLAY, Deputy Director of Agriculture, Uganda ; M.B.E. on MR. F. H. BUTCHER, late Curator, Government Gardens, Ootacamund, Madras, on MR. H. R. EDMUNDS, Superintendent of Agriculture, Kalimpong, Bengal, and on MR. E. W. SWANTON, Curator, Haslemere Educational Museum.

**The Professorship of Botany at Cambridge.**—Sir A. C. Seward, F.R.S., has retired from the Chair of Botany at Cambridge, which he has held since 1906. Mr. F. T. Brooks, F.R.S., Reader in Botany in the University, has been appointed to succeed him.

**Shirley Clifford Atchley.**—The news of the death at the age of 65 of Mr. S. C. Atchley, C.M.G., O.B.E., has been received with profound regret at Kew. For many years he was Translator with the local rank of a First Secretary at the British Legation, Athens, and was well known to all who had an interest in the flora of Greece. He died suddenly of heart failure when climbing Mt. Kyllene on the evening of Saturday, 20 June, 1936, and was buried the next day at the village of Trikala.

Atchley was a most versatile man, of a lovable honest nature, with a whimsical personality, and almost boundless energy. His knowledge of the Greek language was perfect, and his great services to both Great Britain and Greece are indicated in the obituary notice of him published in "The Times" for 22 June, 1936.

In 1929, the Director of Kew wrote to Atchley and asked if, in his wanderings through Greece, he would collect and dry plants for the Herbarium. Atchley at once responded, and there resulted as gifts to Kew a magnificent series of specimens which needed some 4000 sheets in mounting, besides duplicates which have been presented to other institutions. The specimens were carefully collected, well dried, and nearly always abundant. Many of the plants were tentatively (and usually correctly) named before dispatch. Except for the last two parcels, one of which was only received at Kew with a letter from him the day before his death, they have all been mounted and laid in, and thus form a permanent memorial to his botanical activities and his love of botany. The range of localities in his collections is remarkable and indicates his wide personal knowledge of Greece and especially of the mountains. Crete, the Peloponnese, the mountains north of the Gulf of Corinth, Epirus, Euboea, Thessaly, and Greek Macedonia were all traversed by him and searched for plants. Some of his discoveries have already been recorded in Kew botanical publications, and others are to be prepared for printed record. Atchley's collections have filled in many

gaps in the Kew collections and have extended the known distribution of a great many species. Several species new to science were discovered by him, and it is hoped that descriptions of these will appear soon.

In addition to his activities on behalf of the Herbarium, Atchley sent many plants, bulbs, and seeds to the Gardens. Many private gardens have also benefited greatly from similar gifts. Mention should also be made of the great assistance he rendered to visitors to Greece, and especially to those with botanical or horticultural interests. Frequently he accompanied them on their expeditions. Always he gave most valuable help and advice.

On his many visits to Kew, Atchley was always a delightful conversationalist, and his information was not only botanical, but included many amusing stories of his life and experiences in Greece. These visits always resulted in kind offers of future help in the building up of a thoroughly representative set of plants of the Balkan Peninsula. He enjoyed strolling through the Rock Garden, the Herbaceous Ground, and the Alpine House, pointing out his favourite species and genera, offering to send additions, and sometimes asking for seeds or bulbs to be sent to Athens.

The writer wishes to place on record his own deep sense of loss by Atchley's death, and to acknowledge the great help he has received in his studies by correspondence and by conversation with an irreplaceable friend.

W. B. TURRILL.

**Vegetables and Fruits.**—This useful reference work\* should prove to be of great value to workers in a number of different fields, in fact to all those concerned with the utilisation of the edible plant products commonly regarded as vegetables and fruits. Other volumes of the same work deal with vegetable food products not falling under these two categories and with animal food products.

In the introduction to this volume an account is given of the chemical nature of some of the commoner constituents of fruits and vegetables, such as chlorophyll and other colouring matters, organic acids, pectins, vitamins and other substances. The first half of the book (part 1) is devoted to vegetables, including dry legumes; about 150 are dealt with, excluding mushrooms and other edible fungi, which are treated separately. All the well-known vegetables of temperate and tropical regions are included, in addition to those that are little known, or well-known only in their native countries, such as the Chinese water chestnut (*Eleocharis tuberosa*), the udo (*Aralia cordata*) and bamboo shoots. Under fruits an equally wide range is to be found, from such everyday commodities as dates, apples, and citrus fruits to the Kei apple (*Aberia caffra*) and pitaya (*Hylocereus undulatus*).

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\*"The Structure and Composition of Foods" By A. L. Winton and K. B. Winton, Vol. II. Vegetables, Legumes, Fruits. New York, John Wiley & Sons Inc., London, Chapman & Hall Ltd., 1935, pp. 904. Price 75s. net.



Subjects appear in the text under their common name followed by the botanical name and the common French, Spanish, Italian, and German equivalents. Each subject receives a few general introductory remarks followed by information under the headings of "macroscopic structure", "microscopic structure" and "chemical composition". Under the second of these the various tissues of which the commodity in question is composed are described, and helpful illustrations of the anatomy accompany the text. This part of the work is stated in the preface to "represent the authors' original work, in large part here recorded for the first time". The information supplied under "chemical composition" is largely in tabular form and varies somewhat in detail in accordance with the degree of importance of the commodity in question. It has been drawn from many sources and the numerous references, appearing as foot-notes, should prove of special value. A detailed general index is included.

F. N. HOWES.

**Flora of Victoria.\***—In the present work, produced under the direction of Professor Ewart, we have a further regional Flora on the lines of F. M. Bailey's "Queensland Flora," and J. M. Black's "Flora of South Australia." Phanerogams and Pteridophytes are included within the scope of the work, the arrangement following the classification of Engler and Prantl. A complete system of keys enables the student to run down any species, while in addition a short description of each species is provided, as well as notes on geographical distribution, etc. The general format is satisfactory, although some of the illustrations are rather indistinct. It is to be regretted that the International Rules of Nomenclature are not always followed.

**Botanical Magazine.**—Part 2 of volume 159 was published on May 28th. The opening species figured is *Campanula Formanekiana* Degen et Dörfler (t. 9436), a distinct species with a restricted distribution in the mountains of Macedonia. Other species figured are:—*Forsythia ovata* Nakai (t. 9437), an attractive endemic Korean species which, owing to its early flowering and neat habit, has proved a most valuable garden plant; *Linaria delphinoides* Gay (t. 9438), a member of a group of critical toadflaxes endemic in the Iberian Peninsular; *Clematoclethra actinidioides* Maxim. (t. 9439), a Chinese climber belonging to a critical genus allied to *Saurauia*; *Kalanchoe Blossfeldiana* v. Poellnitz (t. 9440), a well-known greenhouse succulent discovered in Madagascar by H. Perrier de la Bâthie and introduced to cultivation by Herr R. Blossfeld of Potsdam; *Saxifraga signata* Engler et Irmscher (t. 9441), a member of the *Hirculus* section discovered in N.W. Yunnan by Forrest in 1906; *Rhododendron chrysodoron* Tagg ex Hutch. (t. 9442),

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\* By Prof. A. J. Ewart. Melbourne University Press and Macmillan & Co. Ltd., 1930. Pp. 1257, 1 coloured plate, 349 text figs. Price 30s.

a beautiful yellow-flowered species of the *Boothii* series from Yunnan; *Narcissus Watieri* Maire (t. 9443), a white-flowered species discovered by M. Watier in the Great Atlas; *Adenophora morrisonensis* Hayata (t. 9444), an endemic Formosan member of a genus closely allied to *Campanula*; *Phalaenopsis Denevei* J. J. Smith (t. 9445), a yellow-flowered species native in Dutch West Borneo, and one of the most striking of recent orchid introductions; and *Picea rubens* Sargent (t. 9446), the Red Spruce of Eastern North America, better known under the name of *P. rubra*, which is invalid for nomenclatural reasons.

**Pollen Grains.\***—At the present time the defects of botanical science due to lack of co-operation between taxonomists and those interested in other branches of the subject are beginning to be appreciated, and the appearance of a book which points the way to a line of co-operation is an important event. Dr. Wodehouse's book on pollen not only shows how a study of pollen grain morphology can serve as an aid to taxonomists but it is also of use to palaeobotanists and those interested in the phylogeny of plants.

The book is divided into two main parts; in the first the subject is treated generally, whilst part two is concerned with classification. The subject matter of the first hundred pages is historical, and deals not only with pollen grains themselves, but also with old views on pollination, fertilization and related subjects. It is of special interest to those familiar with Kew botanists that the epitaph on the tomb of Francis Bauer is reproduced in full. It is a striking fact that very little work on pollen grains was published in England (apart from the very early work of Hooke and Grew) until 1877, when M. P. Edgeworth published his book "Pollen". It is disconcerting to learn that the descriptions in this book "are for the most part erroneous, and the figures purely imaginary, having almost no basis in fact"; also that such fragmentary work as was done on pollen in this country totally disregarded that done on the Continent. Dr. Wodehouse's book continues with sections dealing with the methods of collecting pollen, pollen statistics and atmospheric pollen, whilst a short chapter on the preparation of pollen for microscopical examination will be of special interest to many, as this subject receives little or no treatment in many books on microscopical technique. The study of hay-fever in the U.S.A. has assumed considerable importance recently, and a special chapter on this subject is welcome. It is unfortunate, however, that the plants in this chapter are referred to so frequently only by local names. In a chapter on pollen-grain characters the author shows how the structure of the grains of different species is determined by pre- and post-natal environmental factors, as well as by heredity.

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\*"Pollen Grains. Their Structure, Identification and Significance in Science and Medicine." By R. P. Wodehouse. McGraw Hill Book Co. Inc. New York and London, 1935. Pp. xv + 574. 36s. net.

In the second part, the structure of the pollen grains of fossil and present-day gymnosperms is described, as well as that of a considerable but by no means comprehensive range of angiosperms, arranged under families. Those who wish to use the book for the identification of pollen may be disappointed at the comparatively small number of different kinds (especially amongst monocotyledons) that are dealt with. Only 242 pages are devoted to descriptions of angiosperm grains. It is, of course, impossible to include every species within the compass of a single volume, but such a subject as the interrelationships of gymnosperms might well have been omitted and a greater number of different kinds of grain described. It is also remarkable that, in a book which deals with pollen from so many aspects, no mention is made of pollen in honey. The author has, however, performed a valuable service in demonstrating the importance of pollen-grain morphology by devoting a whole book to the subject, and by providing a high standard of description. The technical terms are defined in a glossary, and, what is still more important, references are given in the glossary to figures in the text which illustrate precisely what is intended by each definition. The book is well bound and printed, and the illustrations are all original and mostly drawn by the author himself.

C. R. METCALFE.

**All about the Soya Bean.\***—The soybean enters largely into the diet of the peoples of China and Japan. Its proteins, carbohydrates and oil are all easily digested and its ash is particularly rich in phosphorus. In these countries it replaces most efficiently meat and dairy products in the diet of the people, both old and young, and thus enables them to compete so successfully with western countries in manufacturing industries. The author's long residence in China, combined with his medical knowledge and training, has enabled him to appreciate fully the properties of this remarkable pulse and to justify his plea for the more extended use of the soybean in this country and in Europe.

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\* By Col. G. D. Gray, M.D., C.B.E., with an Introductory Chapter by J. L. North. London, John Bale, Sons & Danielsson, Ltd. 1936. Pp. ix + 140; plates 7. Price 7s. 6d.

# BULLETIN OF MISCELLANEOUS INFORMATION

No. 6 1936

## ROYAL BOTANIC GARDENS, KEW

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### XXXIV — THE CULTIVATION OF HYDNOCARPUS WIGHTIANUS IN NIGERIA. J. D. KENNEDY.

In 1926, at the request of the British Empire Leprosy Relief Association, some experiments were initiated at Sapoba to ascertain the possibility of growing *Taraktogenos Kurzii* King, and other species of the family *Flacourtiaceae*, for the purpose of obtaining Chaulmoogra oil from the seeds, for the treatment of leprosy.

Several parcels of *Taraktogenos* seeds were received for trial from time to time, and sown in the nursery, but no germination was ever obtained. Like most oil-bearing seeds, their germinative capacity is not retained for any length of time and in all probability their viability had perished in transit.

There is a small tree of the same family, *Caloncoba echinata* Gilg, found in forest regions of Sierra Leone, Liberia and Gold Coast, the seeds of which yield an oil similar to Chaulmoogra oil, but so far this species has not been recorded from Nigeria, although it may occur. Supplies of this seed were obtained from Sierra Leone some years ago and sown in the nursery, but no germination resulted.

Two other trees, *Hydnocarpus Wightianus* Blume and *H. anthelminticus* Pierre, are closely allied to *Taraktogenos Kurzii*, and their seeds yield an oil which is used as a substitute for the true Chaulmoogra oil.

There is no doubt that *H. Wightianus* can be grown at Sapoba and considerable success has attended the experiments.

Although no difficulty was encountered in getting seed of *H. anthelminticus* to germinate, subsequent growth has not been nearly as promising as that of *H. Wightianus* and the trees do not thrive. There are 28 young trees of *H. anthelminticus* growing at Sapoba, but so far no flowering has taken place.

*H. Wightianus* is a common tree in the rain forests of South India, generally in swampy places and as a rule near open water, but it is also commonly found at an elevation of 2000 feet in Travancore.

It is a large evergreen tree, with handsome, dark green, shady foliage. At Sapoba however, its habit is more that of a large bush, having a number of stems arising from ground level and long, drooping, lateral branches.

Climatic conditions in this part of Nigeria are very similar to those found in its natural habitat, where the maximum shade temperature varies from 94° to 99° F. with a minimum of 60°, and an annual rainfall of 90 inches and over.

The climate of Sapoba is typical of the equatorial type and is characterised by an abundant, more or less evenly distributed rainfall of 100 inches or more per annum. There is a very small range in temperature throughout the year. Atmospheric humidity approaches saturation point and the average daily shade temperature is about 90° F., rarely falling below 65° or 70° at night. Violent tornadoes are frequent at the beginning and end of the rains, and it is usual to have a brief rainless period about January when the harmattan blows. The harmattan is a hot desiccating wind which blows from the Sahara Desert and is very severe on plant growth.

The soil is a light sandy loam of great depth and uniformity and characterised by an entire absence of rocks of any kind. I am indebted to the Agricultural Chemist, Ibadan, for the following mechanical analysis of the soil taken from the forest at Sapoba.

Depths	Coarse sand 2·0·2 mm.	Fine sand 0·2·0·02 mm.	Silt & Clay 0·02 & lower	Texture.
0-1ft.	85·7	5·1	9·2	9·9
1-2	76·2	8·3	5·5	5·5
2-3	76·7	6·8	16·5	5·0
3-4	74·3	6·2	19·5	4·1
4-5	73·1	6·6	20·3	3·9

No stones, i.e. particles over 2 mm., occurred in any of the samples. Texture = Coarse and Fine Sand/Silt and Clay.

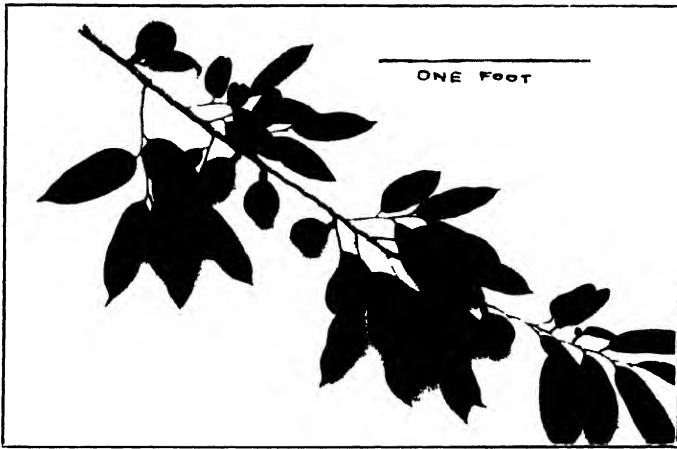
#### NURSERY TREATMENT.

The original sample of seed of *H. Wightianus* was received from India through the Director of Medical and Sanitary Services, Nigeria, in August, 1926. The seed was examined on arrival at Sapoba and found to be in fairly good condition although there was quite a number of rotten seeds; however, the most viable looking seeds were selected and sown in a prepared nursery bed, on a piece of swampy ground, alongside the Jamieson River on 9th August 1926. The seeds were sown in lines 6 inches apart, and 6 inches between seeds. The beds were shaded and watered night and morning.

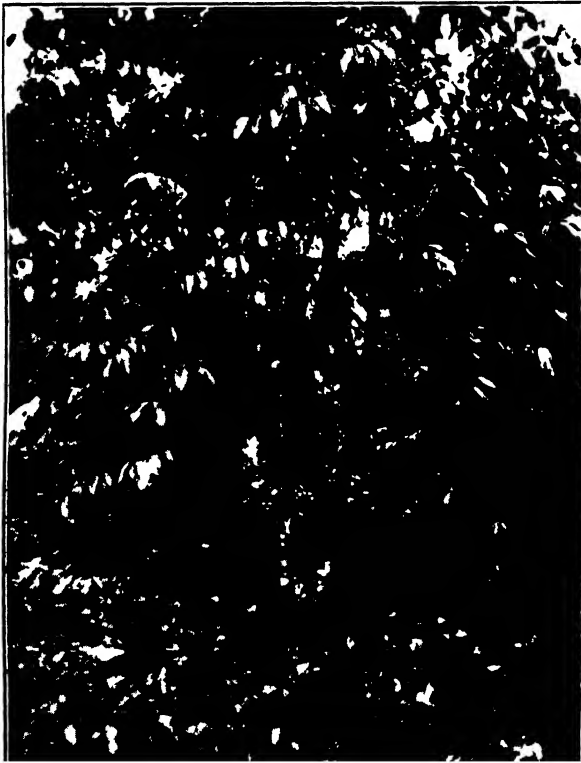
Germination, which in this species is epigeous, started in 30 days; the outer shell cracked to allow the radicle to emerge and grow downwards to form the tap root. The cotyledons were forced above ground and development of the seedling was rapid. The primary root was long with a wealth of lateral rootlets well distributed along the tap root.

When the seedlings were about a foot high they were lifted from the nursery bed and planted out at 6' x 6' in rainy weather, on a cleared area in the same locality. For a long time they stagnated and did not present a promising appearance but eventually they succeeded in getting away.





Fruiting branch of *Hydnocarpus Wightianus*



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Plant of *Hydnocarpus Wightianus*, seven years old

Early in 1927 the crop was completely defoliated by caterpillars but later new foliage appeared and the plants continued to flourish, except those growing on the edge of the swamp where they were more or less inundated. All went well with the crop for another year when a second caterpillar attack occurred, again resulting in complete defoliation. These sudden caterpillar attacks on an exotic plant which is being tried out for the first time are interesting, particularly when no trace of similar infestation is found on the surrounding vegetation in the neighbourhood.

About this time it became obvious that an espacement of 6' x 6' was much too close, so every alternate plant was lifted and the plot extended, making an espacement of 12' x 12'.

The plants growing on the edge of the swamp nearest the river were undersized and rather sickly looking, so they were lifted and successfully transplanted to higher ground.

At the beginning of November it was observed that the leading shoots of several healthy-looking trees had wilted, and later died back for several inches to form a "collar". Examination showed a small pin hole near the collar and on cutting open the shoot a small egg was found in the pith. Some days later a quantity of frass was observed on the ground at the base of one of the most promising plants and further examination showed that a grub had tunnelled down the entire length of the pith, yet the plant appeared to be perfectly healthy and normal, apart from the wilted leading shoot.

No serious permanent damage was apparent from these borer attacks, which continued to the present time (1935). The presence of the grub probably stimulated the growth of new shoots from ground level.

One tree, four years old, which had been attacked by the borer, produced flowers in 1929, and in 1930 one fruit was obtained, the seeds of which were sown in the nursery and gave 100% germination.

Three trees planted at Zaria in the Northern Provinces in 1928 flowered in 1932 and some fruits were also obtained, resulting from previous flowering which had not been observed.

There is no definite season for flowering or fruiting in this country and it is usual to find in the same plot, and sometimes on the same tree, flowers, young fruits about the size of golf balls, and mature fruits.

The flowers are small and inconspicuous, arising singly or in few-flowered clusters in the axils of the leaves which are arranged in two ranks along the branches.

Mature fruits are brown in colour, have a rough exterior, and are about the size and shape of an orange, while young fruits are almost jet black, have a velvety exterior and are not quite spherical. The fruits have a short stout peduncle and are more or less pendulous from the branches. Although there are generally



# XXXV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXVII.\*

NOTES ON THE MEXICAN SPECIES OF THE GENUS *BURSERA*.—A. A. BULLOCK.

## INTRODUCTION.

The present studies were undertaken with a view to providing names for a series of specimens of *Bursera* included in a large collection of Mexican plants sent to Kew during the last few years by Mr. G. B. Hinton. The specimens were collected in the relatively small area covering the districts of Temascaltepec, Coyuca and Huetamo, in the states of Mexico, Guerrero and Michoacan. This important intensive collection is still proceeding, and up to the present 160 numbers of 20 species of *Bursera* have been received; two species are omitted, as they appear to be undescribed, and the material is not yet sufficiently complete.

Thanks to the generosity of the authorities at the Berlin, Paris and Copenhagen herbaria, the writer has had the privilege of examining most of the types enumerated by Engler<sup>1</sup> in the first general review of the genus that can be regarded as modern. This was based on Schlechtendal's<sup>2</sup> enumeration and notes, but included many more species. The next important work on the genus was by Rose<sup>3</sup>, and here Kew is indebted to the authorities at the United States National Herbarium, Washington, for the loan of most of the type material of species published later than Engler's monograph. In the light of the abundant material now available, Rose's work requires modification, his concept of species having been too narrow. This was realised by Standley<sup>4</sup> who reduced to synonymy a great proportion of the species established by Rose and others. On the whole, the writer agrees with Standley's reductions, but one or two important differences have been made in the present treatment, based on the exceptional opportunity which has presented itself of gathering together a long series of specimens of each of the species concerned.

The plants included by various authors under the names *B. fagaroides*, *B. odorata*, and *Elaphrium confusum*, constitute an extremely critical group, the diagnostic characters of which are by no means clear. The types of all three are in different stages of development, so that comparisons based on the descriptions are apt to be misleading; the only method of approach is by the examination of long series of specimens that are demonstrably conspecific, and thereby finding characters by which these and other species differ constantly from each other.

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\* Continued from K.B. 1936, 221.

<sup>1</sup> Engler in DC. Monogr. Phan. 4, 36-60 (1883).

<sup>2</sup> Schlechtendal in Linnaea, 16 (1842) et l.c. 17 (1843), sub *Elaphrio*.

<sup>3</sup> Rose in N. Amer. Fl. 25 (1911), sub *Elaphrio*.

<sup>4</sup> Standley in Contr. U.S. Nat. Herb. 23 (1923) sub *Elaphrio*.

These remarks apply also to such species as *B. jorullensis*, *B. excelsa*, *B. penicillata*, *B. glabrifolia*, and *B. ovalifolia*, to mention only a few, and it may be safely said that, in every case, either the original specimens were too incomplete for an adequate description to be drawn up, or the description omitted one or more points of prime importance.

By collecting specimens from marked trees at different seasons of the year, Mr. Hinton has shown that certain differences between young flowering material and old fruiting material, which have been used diagnostically, are of no value, and that extreme care must be exercised in selecting characters for specific differentiation. Thus characters involving the amount, as distinct from the quality of the indumentum, are valueless in this as in many other genera; the texture of the leaves also can be shown to vary (in dried specimens) according to their age on collection, the method of drying, and particularly on the exact habitat conditions of light and shade. On the other hand, the shape of the seed, the colour of the aril-like pulp more or less surrounding it, and the number of valves of the drupe, are reliable specific characters which have not hitherto received the attention they deserve.

Some of the "doubtful" species listed by Engler, Rose and Standley, have been identified during the course of the work. In the case of *B. Tecomaca* the treatment is very different from that adopted by Standley. *B. Kerberi*, which he regarded as an independent species, is now reduced to *B. Tecomaca*, while *B. fragilis*, which he cited as a synonym of *B. Tecomaca*, is here referred to *B. lancifolia*.

*Bursera Simaruba* (L.) Sarg., not definitely admitted to occur in Mexico by Rose, is included by Standley, who gives five synonyms based on Mexican plants. A study of the West Indian material at Kew leads one to the opinion that it does not occur as a native plant in Mexico, but may have been introduced. Of the synonyms given by Standley, *Elaphrium ovalifolium* Schlecht. (doubtfully included), united with *E. acuminatum* (Rose) Rose, is maintained as a species, and of the remainder, to which may be added *Elaphrium longipes* (Rose) Rose, it is perhaps better to express no opinion until more material of each is available. As far as the type specimens are concerned, they appear to be distinct, and this is particularly so in the case of *E. arboreum* (Rose) Rose.

It is hoped that figures of the newly-described species and of others of a hitherto doubtful nature, may be published in an early number of Hooker's *Icones Plantarum*.

The various herbaria in which the specimens cited are to be found are indicated by the following letters in parentheses after the collector's numbers:—K=Kew, B=Berlin, P=Paris, C=Copenhagen, U=United States National Herbarium, Washington, D.C. Where no special indication is given, the specimen is in the Kew Herbarium.

Finally, I wish to express my indebtedness to Dr. T. A. Sprague, Deputy Keeper of the Herbarium, Kew, without whose help, criticism and encouragement this investigation could not have been undertaken.

#### ECONOMIC NOTES.

Several species of *Bursera* have been exploited commercially, mainly on account of the high percentage of fragrant essential oil in the wood and fruit, and also to a less extent for the sake of their resins. Many are used locally as a source of incense, and all Mexican works on *materia medica* contain references to their value in medicine, particularly in the treatment of uterine diseases; they are also used in the preparation of surgical dressings. The resin of some species is valued for the manufacture of varnishes; on dissolving the resin in turpentine, varnish of high quality is obtained.

Perhaps owing to the unsettled nature of large areas in Mexico, the commercial possibilities of the individual species have never been thoroughly tested or fully exploited, and the taxonomic difficulties encountered in dealing with the genus render it impossible to refer with certainty any product to a definite species. There is no doubt that trade names apply to products derived from several species.

An account of Mexican Linaloe oil is to be found in Finnemore, "The Essential Oils" p. 479 (1926), where the source of supply is stated to be *B. Delpechiana* or *B. Aloëxylon*. In the present paper these two species are united with *B. penicillata* and *B. glabrifolia* respectively. *B. fagaroides* is also mentioned as producing an oil with the odour of caraway. A similar account is given in the second English edition of Gildemeister, "The Volatile Oils," 3, p. 118 (1922). In both the above accounts, copious references to the original places of publication of the information, mainly in the "Perfumery and Essential Oil Record," are given, and need not be repeated here.

Probably the first notice of the Mexican product in this country was in 1869, when Collins published an account of "The Linaloe Wood of Mexico" in Pharm. Journ. Ser. 2, 10, 590-593 (1869). In this article "*Amyris Tecomaca* DC." and "*Elaphrium graveolens* H.B.K." are given as the source of supply, but there is little doubt that this is erroneous\*, and that *B. penicillata* and *B. glabrifolia* are the species most concerned.

The next important account is by Holmes, in Perf. & Ess. Oil. Rec. Mar. 1910, pp. 57-60, where there is a description of the tree, and a rather poor figure purporting to be of "*B. Delpechiana*." A comparison between the wood-structure of *B. Delpechiana* (*B. penicillata* of this paper) and *B. Aloëxylon* (*B. glabrifolia*), is given,

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\* But see also Heller, Reis. Mex. 426 (1853), where *Amyris Tecomaca* is also referred to as a source of oil. Only the difficulty in checking the identification renders this doubtful; the plant may well be of use as an oil producer.—A.A.B.

and also an account of the physical and chemical properties of the oil, which is produced by Mexican Indians in a very primitive manner, mainly from the wood of trees 40–60 years old. Various wounding operations are carried out on younger trees, which induce the secretion of oil as a pathological product. No attempt at regeneration is made, although the plant grows readily from twigs stuck in the ground, without any preparation or care. Some oil is prepared from the drupes, but this is of poorer quality, and is usually mixed with the wood oil.

In 1910, Mr. P. J. Anderson, accompanied by Mr. G. N. Humphries\*, went to Mexico to study "*B. penicillata*" in its native home, and eventually the former opened a plantation in India, where the plant was grown from the seed he had collected in Mexico. Using modern distilling plant, he has been able to obtain from the dried drupe valves an oil of good quality. The late Prof. Sir I. Bayley Balfour took a great interest in the experiment, and cuttings from Mr. Anderson's Indian plantation were grown in the Royal Botanic Garden, Edinburgh. A report on the Indian oil, compared with the native-produced Mexican variety, appeared in Bull. Imp. Inst. 29, 182-3 (1931).

Elemi is the name given to a number of oleo-resins derived from different botanical sources. Probably all belong to the family Burseraceae. Manila Elemi is the most important commercially, but some comes from Mexico, probably collected from several species, including *B. jorullensis* and *B. copallifera*. It is doubtful whether *B. elemifera* can be regarded as a source of supply. The resin is used in the preparation of ointments, lithographic inks and varnishes.

On the whole, little is known concerning the great majority of species, and it seems likely that a careful examination of many of them, and controlled exploitation, would prove profitable. At present, apparently, no control is exercised, and the oil-yielding trees are being rapidly exterminated.

The following authorities, all yielding some information concerning the economic uses of species of *Bursera*, have been consulted, in addition to those mentioned above :—

GUIBOURT, *Hist. Nat. des Drogues*, 3, 491 (1849-51).

WOOD ET BACHE, *U.S. Dispensatory*, 324, 1309, 1396 (1854).

ROSENTHAL, *Synops. Pl. Diaph.* 865–866 (1862).

ANDRES, *Fabrication of Volatile and Fat Varnishes*, 63–64 (1882).

WITTSTEIN, *Handw. Pharmakog. des Pflanzenr.* 379–380, 832 (1882).

FLUCKIGER ET HANBURY, *Pharmacographia*, 152 (1879).

PLANCHON ET COLLIN, *Les Drogues Simples*, 2, 556–560 (1896).

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\* See Simmonds in Perf. and Ess. Oil Rec. Dec. 1934, 378-9. Living plants, sent to Edinburgh from India by Mr. Anderson, have been received at Kew after this paper went to press; they represent *B. glabrifolia* and *B. jorullensis*.

DRAGENDORF, *Die Heilpflanzen*, 370-371 (1898).

PARRY, *Chem. of Essential Oils and Artificial Perfumes*, 449-453 (1908).

TSCHIRCH, *Hanbd. der Pharmakog.* 1, 408-409 (1909) ; *l.c.* 2, 832-835 (1912) ; *l.c.* 3, 1136 (1925).

WIESNER, *Die Rohst. des Pflanzenr.* 4 Aufl. 1, 88 (1927).

#### ANATOMY.

Very little is known concerning the anatomy of any species of *Bursera*. The West Indian *B. gummifera* has been examined more closely than any other, but even in this case much remains to be done. It is not the purpose of this paper to examine the anatomy of the genus, but a few selected references are given below for the convenience of future workers :—

(1) Solereder, transl. Boodle et Fritsch, *Syst. Anat. Dicot.* 1, 190 ; 2, 869 (1908), cum bibliogr.

(2) Guillaumin, *Recherches sur la Structure et le développement des Burseracées. Application à la Systématique.* (Thesis : Paris, 1910).

(3) Record et Mell, *Timbers of Trop. Amer.* 337-8 (1924).

Most of the anatomical work done on the family concerns Asiatic species, but Guillaumin refers to some Mexican species in a very cursory manner. A comparison between the woods of *B. penicillata* and *B. glabrifolia* appeared in *Perf. & Ess. Oil. Rec. Mar.* 1910, 60, but this was too incomplete to be of permanent value.

It is hoped that suitable wood-samples will become available for study at Kew and elsewhere in the near future.

#### TAXONOMY.\*

The following key, based mainly on the characters of the mature leaflets, includes all the Mexican species except *B. submoniliformis*, *B. heterophylla*, *B. longipedunculata*, *B. arborea* and *B. Karwinskii*. These are too incompletely known to render their inclusion useful. Most of the specimens seen can be identified by applying the key with some freedom. The presence or absence of wings of the leaf-rachis, used as a primary key character by both Rose and Standley, has proved to be unreliable, and I have discarded it. Apart from the primary dichotomous division, no attempt to arrange the species according to a natural classification has been made ; in the present state of our knowledge of the genus, such an arrangement would present insuperable difficulties from the point of view of the construction of a workable key. On the other hand, many groups of closely allied species, which were widely separated by both Rose and Standley, have been brought together.

In a few cases where the mature fruit is unknown, I have assumed that tetramerous flowers will give rise to two-valved drupes, and

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\* The generic name *Bursera*, antedated by *Terebinthus*, is conserved.—A.A.B.

trimerous flowers to three-valved drupes. More use might, perhaps, have been made of inflorescence characters, but in view of the fact that many species are unknown in the flowering stage, and that the distribution of the sexes, as well as the effect of such distribution on the form and size of the inflorescence, still remains to be investigated, it was considered advisable to omit such characters even where known.

Obviously a considerable amount of field work remains to be done, and any deficiencies that may be discovered in the key will indicate the direction such field work should take.

## KEY TO THE MEXICAN SPECIES OF BURSERA.

Drupae bivalves; flores tetrameri:

Folia  $\pm$  bipinnata; semina dimidio inferiore arillo induta:

Foliola parva, usque ad 1 cm. longa:

Foliola integerrima,  $\pm$  rotundata .....*B. bipinnata*

Foliola marginibus crenis paucis irregulariter dispositis

praedita, anguste elliptica vel lanceolata vel

oblanceolata .....*B. stenophylla*

Foliola majora, usque ad 3 cm. longa,  $\pm$  regulariter

crenata vel dentata:

Foliola acuta vel acuminata:

Folia glabra vel parcissime pubescentia .....*B. elemifera*

Folia satis dense pubescentia .....*B. collina*

Foliola utrinque obtusa vel rotundata .....*B. diversifolia*

Folia unifoliolata vel simpliciter pinnata:

Folia unifoliolata:

"Nervi laterales numerosi, late patentes" .....*B. cerasifolia*

Nervi laterales 5-8, ascendentes .....*B. Hindsiana*\*

Folia trifoliolata:

Folia utrinque  $\pm$  dense pubescentia .....*B. Hindsiana*

Folia glabra vel utrinque parcissime pilosa .....*B. biflora*

Folia 5- $\infty$  foliolata:

Semina dimidio inferiore arillo induta:

Foliola crenis paucis satis profundis praedita:

Foliola subtus parce pubescentia vel glabra .....*B. laxiflora*

Foliola subtus pubescentia vel tomentosa .....*B. filicifolia*

Foliola  $\pm$  regulariter serrato-crenata:

Foliola apice rotundata, supra  $\pm$  nitida .....*B. glabrifolia*

Foliola apice acuta vel acuminata:

Rachis foliorum nodis penicillato-barbata;

folia ceterum pilis brevis  $\pm$  induta vel

glabra .....*B. penicillata*

Rachis foliorum nodis haud penicillato-barbata;

folia pilis longis utrinque vestita .....*B. coyucensis*

Semina tota vel fere tota arillo induta:

Foliola anguste lanceolata, usque ad 8 cm. longa,

supra nitida, subtus albido-tomentosa .....*B. bicolor*

Foliola haud lanceolata, plerumque latiora:

Foliola crenis paucis satis profundis irregulariter

praedita; inflorescentiae graciles, 2-vel

pauciflorae:

Foliola glabra vel subtus parce pubescentia .....*B. laxiflora*

\* I have seen no fruit of this plant. Brandegee states that he has seen the plant with 1-9 leaflets, but I have seen no specimen showing more than three.—A.A.B.

- Foliola subtus dense pubescentia vel tomentosa .....*B. filicifolia*  
 Foliola regulariter crenata vel dentata :  
 Foliola supra valde rugosa, leviter pubescentia,  
 subtus pubescentia usque tomentosa .....*B. jorullensis*  
 Foliola supra velutina, subtus tomentosa :  
 Foliola elliptica vel ovata, 3–5-jugata, circiter  
 5 cm. longa .....*B. excelsa*  
 Foliola oblonga, 9–12-jugata, usque ad 2 cm.  
 longa .....*B. velutina*  
 Foliola lanceolata, 4–5-jugata, circiter 2 cm.  
 longa .....*B. copallifera*\*  
 Foliola supra glabra vel pubescentia, subtus ±  
 pubescentia :  
 Foliola usque ad 4 cm. longa sed plerumque  
 minora :  
 Foliola apice ± rotundata, supra ± nitida,  
 glabra vel parce pilosa .....*B. glabrifolia*  
 Foliola apice acuta vel acuminata :  
 Rachis foliorum nodis penicillato-barbata,  
 ceterum glabra vel ± pubescens .....*B. penicillata*  
 Rachis foliorum nodis haud penicillato-  
 barbata ; foliola 15–21, supra pilis  
 brevibus satis dense vestita, subtus  
 dense pubescentia .....*B. aspleniifolia*  
 Foliola multo majora, usque ad 14 cm. longa,  
 plerumque 6–10 cm. longa :  
 Infructescentia 15–25 cm. longa .....*B. Hintoni*  
 Infructescentia circiter 6 cm. longa .....*B. excelsa*  
 Drupae trivalves ; flores trimeri :  
 Folia 1-vel 3-foliolata :  
 Folia glaberrima :  
 Folia semper 1-foliolata, ovata, acuta.....*B. Schlechtendalii*  
 Folia 1-vel 3 foliolata, foliolis apice obtusis vel  
 rotundatis :  
 Folia satis longe petiolata ; foliola oblonga  
 usque obovata .....*B. trimera*  
 Folia brevius petiolata ; foliola ovata .....*B. subtrifoliolata*  
 Folia semper 3-foliolata, foliolis apice longe caudatis .....*B. Tecomaca*  
 Folia utraque pagina satis dense pubescentia, semper  
 3-foliolata .....*B. trifoliolata*  
 Folia 5-∞-foliolata :  
 Foliola magna, usque ad 12 cm. longa et 7 cm. lata, sed  
 plerumque circiter 5 cm. longa et 2.5 cm. lata :  
 Drupae pubescentes ; folia subtus praesertim ± dense  
 pubescentia .....*B. grandifolia*  
 Drupae glabrae ; folia glabra vel interdum parce  
 pubescentia :  
 Foliola integra, ovata, obovata, vel elliptica :†  
 Foliola sessilia vel brevissime petiolulata.....*B. ovalifolia*  
 Foliola distincte petiolulata .....*B. longipes*

\* I have not seen mature leaves of this plant. *B. submoniliformis* should, I think, come here, but the available material makes it impossible to include it safely.—A.A.B.

† *B. arborea* comes into this group, and may be distinguished by its smaller, more numerous drupes. Having seen only the type, I have been unable to find any good key character to separate it more definitely, though I cannot agree with Standley's treatment of it as conspecific with *B. Simaruba*.—A.A.B.

- Foliola serrato-crenata, oblongo-lanceolata .....*B. lancifolia*  
 Foliola multo minora, vel elongato-oblongo-lanceolata :  
   Foliola elongato-oblongo-lanceolata :  
     Foliola distante serrato-crenata .....*B. multijuga*  
     Foliola basin versus tantum serrato-crenata .....*B. rubra*  
     Foliola anguste linearia, acuta .....*B. Galeottiana*  
     Foliola lineari-oblonga, vel oblonga, interdum valde  
       parvae :  
       Foliola multijugata, plerumque latitudine 3-4-plo  
       longa .....*B. microphylla*  
       Foliola 2-4-jugata, interdum valde parvae, plerumque  
       latitudine sesquialonga .....*B. arida*  
     Foliola anguste ovata vel elliptica vel obovata, ±  
       crenata vel integra :  
       Foliola glabra :  
         Foliola apice acuta vel acuminata .....*B. confusa*  
         Foliola apice obtusa vel rotundata .....*B. fagaroides*  
       Foliola ± dense pubescentia, apice acuta vel  
       subacuta .....*B. sessiliflora*

#### ENUMERATION OF SPECIES.\*

**Bursera arborea** (Rose) Bullock, comb. nov. *Terebinthus arborea* Rose in Contr. U.S. Nat. Herb. **10**, 118 (1906). *Elaphrium arboreum* (Rose) Rose in N. Amer. Fl. **25**, 247 (1911).—*Elaphrium Simaruba* Standl. in Contr. U.S. Nat. Herb. **23**, 547 (1923) partim, non Rose (1911), nec *Pistacia Simaruba* L. (1753).

Rose states that this is a common tree along the coastal plain of Tepic and southern Sinaloa, but I have seen only the type specimen. It appears to be a distinct species, having smaller and more numerous drupes than any of the other Mexican plants with which Standley unites it under the name *Elaphrium Simaruba*.

STATE OF TEPIC : Between Rosario and Concepcion, July 1897 (fr.), Rose 3259e (U ; type).

**Bursera arida** (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Terebinthus arida* Rose in Contr. U.S. Nat. Herb. **10**, 118, t. 36 (1906). *Elaphrium aridum* (Rose) Rose in N. Amer. Fl. **25**, 249 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 548 (1923).

This is very near to *B. microphylla*, and indeed may be no more than a depauperated form of it.

STATE OF PUEBLA : Near Tehuacán, 1905, Rose and Painter 9985 (U ; type) ; *ibid.* Aug. 1901, Rose and Painter 5864 (B) ; *ibid.* 1906, Rose and Rose 11424.

**Bursera aspleniifolia** T. S. Brandeg. in Univ. Calif. Publ. Bot. **3**, 382 (1909). *Elaphrium aspleniifolium* (T. S. Brandeg.) Rose in N. Amer. Fl. **25**, 254 (1911).—*Elaphrium sessiliflorum* Standl. in Contr. U.S. Nat. Herb. **23**, 552 (1923), quoad syn., non *Bursera sessiliflora* Engl. (1883).

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\* Pending the discovery of a natural classification, an alphabetical arrangement of the species has been adopted.



This is certainly not conspecific with *B. sessiliflora* (q.v.), as suggested by Standley; its status must remain doubtful until more material be . . . y.

STATE OF I . . . anapa, July 1908, *Purpus* 3162 (B, U; type number).

**Bursera bicolor** (Willd. ex Schlecht.) Engl. in Engl. Bot. Jahrb. 1, 44 (1881), et in DC. Monogr. 4, 53 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896); Rose in Contr. U.S. Nat. Herb. 5, 113 (1897). *Elaphrium bicolor* Willd. ex Schlecht. in Linnaea, 17, 625 (1843); Rose in N. Amer. Fl. 25, 252 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 550 (1923). *Terebinthus bicolor* (Willd. ex Schlecht) Rose in Contr. U.S. Nat. Herb. 10, 118 (1906). *Amyris bicolor* Willd. MS. in herb. ex Schlecht. l.c. in syn.

One of the very few species concerning which there has never been any doubt or disagreement. The large pinnate leaves, which become almost glabrous above when mature, are persistently and densely tomentose below. The leaflets are long-lanceolate, and when young tend to curl, thus obscuring the tomentum of the lower surface, and appearing to be almost terete and glabrous.

STATE OF MEXICO: District of Temascaltepec; Guayabal, 790 m., June 1933 (fl., young fr.), *Hinton* 4151; *ibid.* (from the same tree), Dec. 1934 (old leaves and stems only), *Hinton* 7129; Ixtapan, 1000 m., May 1933 (fl.), *Hinton* 3913; *ibid.* May 1935 (fl.), *Hinton* 7730.

STATE OF GUERRERO: Pungarabato, District of Coyuca, June 1934 (fl.), *Hinton* 6128; *ibid.* Nov. 1934 (fr.), *Hinton* 6958; Taxmalac, Oct. 1904 (fr.), *Seler* 4267 (B).

STATE OF MORELOS: Lava fields near Cuernavaca, 1500 m., June 1896 (young fr.), *Pringle* 6325; *ibid.* May 1898 (fl.), *Pringle* 6844 (K,B); *ibid.* Sept. 1903 (fr.), *Rose and Painter* 6958 (C); "In regione Real de Huantla ad S. Francisco Jetecala aliisque terrae Mexicanae calidioris locis Junio florentia.....Aug. et Septembri fructifera," *Schiede* num. Schlecht. non cit. (type; not seen); *ibid.* *Knechtel* 702 (herb. Vindob., teste Engler; not seen).

STATE OF VERA CRUZ: San Carlos, Dec. 1842 (fr.), *Liebmann* 32 (C).

Without exact locality: *Karwinski* s.n. (herb. Monac., teste Engler; not seen).

**Bursera biflora** (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 4, 217 (1929). *Terebinthus biflora* Rose in Contr. U.S. Nat. Herb. 10, 119 (1906). *Elaphrium biflorum* (Rose) Rose in N. Amer. Fl. 25, 253 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 550 (1923).

STATE OF PUEBLA: Near Tehuacán, Aug. 1897 (fr.), *Pringle* 6686 (U; type); *ibid.* Aug. 1901, *Rose* 5903 (U); *ibid.* June 1912, *Purpus* 1299 (B); *ibid.* Dec. 1841 (fr.), *Liebmann* 12338 in herb. Mus. Bot. Haun. (C); Tlacuiloltepec, July 1909 (fr.), *Purpus* 4068 (B).

***Bursera bipinnata*** (Sessé et Moc. ex DC.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 49 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896); Riley in Kew Bull. 1923, 167. *Am.* ... s. ex DC. in DC. Prodr. **2**, 82 (1825); Alph. DC. Calq. Dess. t. 189 (1875). *Elaphrium bipinnatum* (Sessé et Moc. ex DC.) Schlecht. in Linnaea, **17**, 631 (1843); Rose in N. Amer. Fl. **25**, 249 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 548 (1923). *Terebinthus bipinnata* (Sessé et Moc. ex DC.) W.F. Wight ex Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Rhus filicina* Sessé et Moc. ex DC. in DC. Prodr. **2**, 67 (1825); Alph. DC. Calq. Dess. t. 189 (1875).—*Bursera gracilis* Engl. in DC. Monogr. **4**, 50 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Terebinthus gracilis* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium gracile* (Engl.) Rose in N. Amer. Fl. **25**, 249 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 548 (1923).—*Bursera bipinnata* var. *pilosa* Engl. MS. in herb. Berol.—*Bursera bipinnata* var. *ovalifolia* Donn. Smith MS. in herb. Berol.

The reduction of *Bursera gracilis*, distinguished from *B. bipinnata* by Engler mainly on account of its more or less pubescent leaves, was suggested by Standley, and the long series of specimens now available for study leaves little doubt that it is merely a form with reduced leaves. The pubescence, relied upon by Engler, is of no diagnostic value. The relative length of calyx and corolla, made use of by Rose and later by Standley to separate them is also of no value, quite as much variation in this respect being observable in a single inflorescence as was used by them for specific differentiation. The leaves vary from almost the completely bipinnate to the simply pinnate condition, a whole leaf in the latter case often being comparable in size with a single (lower) pinna in the former.

The closely allied *B. stenophylla* with its larger, more diffuse leaves, narrower leaflets, and smaller aril, is sufficiently distinct.

Mr. Hinton has enriched the already good representation of *B. bipinnata* at Kew by 14 magnificently collected numbers, as indicated in the enumeration below.

The type specimen of *B. gracilis* in the Paris herbarium (also a portion at Berlin), bears the legend "Xochicalco, 30 June 1866", with no indication as to the collector. It is a flowering specimen, with young leaves. I have been unable to trace the locality. There is, however, a village of Xochicalco, 18 miles west of Cuernavaca (Morelos).

STATE OF MEXICO: District of Temascaltepec; Temascaltepec, 1800 m., May 1932 (fl.), *Hinton* 813; *ibid.* 1750 m., June 1933 (fl. and young fr.), *Hinton* 4183; *ibid.* Oct. 1934 (fr.), *Hinton* 6789; *ibid.* June 1935 (fl.), *Hinton* 7698; *ibid.* June 1935 (fl.), *Hinton* 7699; Nanchititla, May 1933 (fl.), *Hinton* 3969; Tejupilco, 1340 m. July 1933 (young fr.), *Hinton* 4378; Vigas, Aug. 1934 (fr.), *Hinton* 6512; *ibid.* May 1935 (fl.). *Hinton* 7733; Cañitas, Jan. 1935 (fr.),

*Hinton* 7296 ; Volcán, Feb. 1935 (fr.), *Hinton* 7332 ; Pungarancho, March 1935 (fr.), *Hinton* 7569 ; Ixtapan, May 1935 (fl.), *Hinton* 7729 ; Villa Neda, May 1935 (fl.), *Hinton* 7795.

STATE OF SINALOA : Near Colomas, Sierra Madre (foothills), July 1897 (fl. and young fr.), *Rose* 1756 ; Cerro Colorado, *Brandeggee* (not seen).

STATE OF TEPIC : Sierra del Nayarit, *Diguet* s.n.

STATE OF JALISCO : Near Guadalajara, June 1889 (fl.), *Pringle* 2572 (K,B) ; *ibid.* June 1886 (fl.), *Palmer* 99 ; *ibid.* rocky bluffs of the Rio Grande de Santiago, Oct. 1889 (fr.), *Pringle* 2332 ; Huejotitan, May 1912 (fl.), *Diguet* s.n.

STATE OF COLIMA : Without exact locality, 1880 (fr.), *Kerber* s.n. (B).

STATE OF MICHOACAN : Jorullo, *Schiede* s.n. (K, B).

STATE OF GUERRERO : Acapulco, *Haenke* s.n. (B) ; Sierra Madre, 1700 m., in granitic soil, June 1899 (fl.), *Langlassé* 1050 (Michoacan?).

STATE OF VERA CRUZ (?) : Trapiche de la Concepcion, July 1842 (fr.), *Liebmann* 74 (C).

Also in Guatemala [Dept. Huehuetenango, 1400 m., July 1896 (fr.), *Seler* 3108 (B)].

***Bursera cerasifolia*** T. S. Brandeg. in Proc. Calif. Acad. Ser. 2, 3, 121 (1891) ; Rose in Contr. U.S. Nat. Herb. 5, 113 (1897). *Terebinthus cerasifolia* (T. S. Brandeg.) Rose in Contr. U.S. Nat. Herb. 10, 119 (1906). *Elaphrium cerasifolium* (T. S. Brandeg.) Rose in N. Amer. Fl. 25, 244 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 546 (1923).

The inadequate original description indicates that this is an ally of *B. Schlechtendalii* or *B. Hindsiana*. It has simple (unifoliolate?) leaves, with many wide-spreading lateral veins.

LOWER CALIFORNIA : San José del Cabo, 1890, *Brandeggee* (type in herb. Univ. Calif. ; not seen).

***Bursera collina*** T. S. Brandeg. in Zoe, 5, 204 (1905) ; Riley in Kew Bull. 1923, 167. *Elaphrium collinum* (T. S. Brandeg.) Rose in N. Amer. Fl. 25, 248 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 548 (1923).

I have not seen this plant, but it evidently belongs to the same group of species as *B. diversifolia* and *B. elemifera*, and like them may be a hybrid, one parent being *B. bipinnata*.

STATE OF SINALOA : Cofradia, *Brandeggee* (type in Herb. Univ. Calif. ; not seen).

***Bursera confusa*** (Rose) Bullock, comb. nov. *Elaphrium confusum* Rose. in N. Amer. Fl. 25, 251 (1911).—*Bursera tenuifolia* Rose in Contr. U.S. Nat. Herb. 3, 314 (1895), et l.c. 5, 113 (1897), non Engl. ex. O. Kuntze, Rev. Gen. 107 (1891) ; Riley in Kew Bull. 1923, 169. *Terebinthus tenuifolia* (Rose) Rose in Contr. U.S. Nat.

Herb. 10, 122 (1906). *Elaphrium tenuifolium* (Rose) Rose in N. Amer. Fl. 25, 252 (1911).—*Bursera lonchophylla* Sprague et Riley in Kew Bull. 1923, 168.—*Elaphrium odoratum* Standl. in Contr. U.S. Nat. Herb. 23, 549 (1923) partim, non Rose (1911), nec *Bursera odorata* T. S. Brandeg. (1889).

Standley united this with Brandegees's *Bursera odorata*, but although I have not seen Brandegees's type, the various published descriptions lead me to the conclusion that *B. odorata* is more probably a form of *B. fagaroides*, a view which Brandegees himself expressed only two years after publishing his species.

*B. confusa* may be distinguished from *B. fagaroides* by its usually more numerous, acuminate leaflets, pale bark with red lenticels, and by the fact that the inflorescence often elongates to as much as 4 cm.

STATE OF MEXICO: District of Temascaltepec; Cañitas, Nov. 1934 (fr.), *Hinton* 6992; *ibid.* May 1935 (fl.), *Hinton* 7736; Acatitlán, April 1935 (fr.), *Hinton* 7656\*; *ibid.* May 1935 (young and old fr.), *Hinton* 7792; Luvianos, April 1935 (fl.), *Hinton* 7660; Palmar, May 1935 (fl.), *Hinton* 7772; Villa Neda, May 1935 (fl.), *Hinton* 7796.

STATE OF SINALOA: Cerro del Muerto, Choix, May 1921 (fr.), *Ortega* 896 (type of *B. lonchophylla*); El Posole, Ahome (fr.), *Ortega* 5569; Lodiego, Oct. 1891 (fr.), *Palmer* 1581 (U, C; type of *B. tenuifolia*).

STATE OF TEPIC: Acaponeta, June 1897 (fl.), *Rose* 1493.

STATE OF JALISCO: Near Tapotla, May 1893 (fl.), *Pringle* 4372 (K; type collection).

STATE OF MICHOACAN: District of Huetamo; Mal Paso, May 1934 (fl.), *Hinton* 6025.

STATE OF GUERRERO: District of Coyuca: Pungarabato, April 1934 (fl.), *Hinton* 5952; *ibid.* June 1935 (fl. and young fr.), *Hinton* 7847; *ibid.* June 1935 (young fr.), *Hinton* 7849; Placeres, June 1934 (fl.), *Hinton* 6102; Chacamerito, Nov. 1934 (fr.), *Hinton* 6953; Cutzamala, June 1935 (fl.), *Hinton* 7846; Querendas, June 1935 (fl.), *Hinton* 7851.

***Bursera copallifera*** (Sessé et Moc. ex DC.) *Bullock*, comb. nov. *Elaphrium copalliferum* Sessé et Moc. ex DC. in DC. Prodr. 1, 724 (1824); Alph. DC. Calq. Dess. tt. 202, xxxB (1875), saltem quoad fl. et fol.; Engl. in DC. Monogr. 4, 59 (1883) sub spp. dub.; Rose in N. Amer. Fl. 25, 257 (1911) sub spp. dub.; Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923) sub spp. dub. *Amyris copallifera* (Sessé et Moc. ex DC.) Spreng. Syst. Veg. 2, 219 (1825); Oliva in La Naturaleza, 1, 40 (1869).

The Sessé and Mociño figure given by Alph. De Candolle appears to be a mixture. The picture of a leafy twig with inflorescences shows the latter to be almost as long as the leaves, the lower half or third

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\* This specimen shows fruit of the previous season, without leaves.

being naked, whereas the picture of the fruiting branch shows the drupes to be solitary on very short pedicels. De Candolle's description, however, applies to the leafy flowering branch, and this is accordingly taken as lectotype.

Mr. Hinton's specimen also shows young leaves and inflorescences, and there seems to be no doubt that it is conspecific with Sessé and Mociño's plant. A new description will be prepared when more complete material becomes available.

STATE OF MEXICO: Pantoja, District of Temascaltepec, April 1935 (fl.), *Hinton* 7647.

***Bursera coyucensis* Bullock**, sp. nov., ramis hornotinis pilis longis praeditis, inflorescentiis foliisque longe pilosis, sed ramis annotinis glabris crassis longitudinaliter lineatis distincta; a *B. copallifera* (Sessé et Moc. ex DC.) Bullock indumento distincto, foliolis grossius serratis facile distinguenda.

*Frutex* vel *arbor* parva, 1.5–4 m. alta; rami annotini satis crassi, glabri, longitudinaliter lineati, rubro-brunnei; rami longi hornotini pilis patentibus satis dense induti. *Folia* (adulta) imparipinnata, 3–5-juga, ambitu obovato-ob lanceolata, apice ramulorum congesta vel alterna, interstitiis inter juga late serrato-alatis supra plus minusve nitida, utrinque prominenter longe pilosa, petiolis 1–2 cm. longis dense pilosis; foliolum terminale anguste rhomboideo-obovatum, usque ad 3.8 cm. longum et 1.5 cm. latum, apice acutum basi plus minusve cuneatum; foliola lateralia sessilia, oblonga vel anguste elliptica, apice subacuta, basi subacuta usque rotundata, saepe leviter inaequilateralia, superiora usque ad 3 cm. longa et 1 cm. lata, inferiora gradatim minora; omnia marginibus grosse subdupliciter crenato-serrata. *Inflorescentia*\* ex axillis perularum prius quam folia orta, longissime pilosa, anguste thyrsoides, ramulis secundariis valde abbreviatis 2–3-floris, pedunculo circiter 1 cm. longo, tota 2.5 cm. longa, circiter 12-flora, bracteis inferioribus linearibus vel filiformibus usque ad 7 mm. longis, pedicellis circiter 2 mm. longis supra medium articulatis. *Flores* flavi, tetrameri, masculi tantum visi. *Sepala* basi connata, triangulari-subulata, fere 3 mm. longa, extra longe pilosa, intus glabra. *Petala* oblongo-spathulata, apice subacuta, 3.5–4 mm. longa, fere 2 mm. lata, extra pilosa, intus glabra. *Stamina* 8, filamentis filiformibus 2 mm. longis, antheris lineari-oblongis 1.5 mm. longis. *Discus* tenuis, crenatus. *Ovarium* abortivum, minutum, globosum, apice stylo trifido coronatum. *Infructescentia* usque ad 4.5 cm. longa, pedunculo usque ad 2 cm. longo; drupae 1–3, ellipsoideae vel plus minusve obovoideae, 8–9 mm. longae, 6 mm. diametro, apice acutae sed vix apiculatae, pallide brunneae, glabrae, ut videtur bivalvatae. *Semina* ellipsoidea, leviter dorsiventraliter compressa, 7 mm. longa, 5 mm. lata; testa nigra; arillus cupuliformis, sicco rugosus, 5 mm. altus.

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\* Only very young inflorescences have been seen; mature ones may be much longer.—A.A.B.

STATE OF GUERRERO : District of Coyuca ; Coyuca-Querendas, " tree 4 m., flower yellow," April 1934 (fl.), *Hinton* 5961 ; Pungarabato, " shrub 4 m.," July 1934 (young fr.), *Hinton* 6272 ; *ibid.* Oct. 1934 (fr.), *Hinton* 6895 (type).

A specimen in the Kew herbarium, collected by Hartweg (No. 261) at Leon, may belong to this species. The material is, however, too young for accurate diagnosis.

No close affinity has been found for *B. coyucensis* ; the peculiar long indumentum is sufficient to separate it from all other species of the genus. In a very general way, it is of similar habit to *B. copallifera* (Sessé et Moc. ex DC.) Bullock, an identification of which is given on page 357.

***Bursera diversifolia*** Rose in Contr. U.S. Nat. Herb. 5, 113 (1897). *Terebinthus diversifolia* (Rose) Rose, *l.c.* 12, 279 (1909). *Elaphrium diversifolium* (Rose) Rose in N. Amer. Fl. 25, 248 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 548 (1911).

This is known only from inadequate material. At once recalling *B. glabrifolia*, it differs in often having bipinnate leaves and thus stands in the same relation to that species as *B. elemifera* does to *B. penicillata*. Careful examination of all these species in the field is required in order to decide on the status of each. The question whether hybridisation between *B. bipinnata* and *B. glabrifolia* and *B. penicillata* takes place needs to be examined. Such hybrids could well account for the great variation observed in the three primary species, for the fact that the bipinnate condition of the leaves is rarely complete and often much reduced, and for the fact that both *B. elemifera* and *B. diversifolia* have been found only once. The last remark applies also to *B. collina*, which I have not seen, but which undoubtedly belongs to the same group. The only known specimen of *B. diversifolia* is :—

STATE OF CHIAPAS : Ocuilapa—Tuxtla, 500–1000 m. (approx.), Aug. 1895 (fr.), *Nelson* 3066 (U ; type).

***Bursera elemifera*** (Royle) Baill. Traité de Bot. Méd. 952 (1884). *Elaphrium elemiferum* Royle, Mat. Med. 344 (1847), et *l.c.* ed. II. 390 (1853), non *Amyris elemifera* L. (1759) ; le Maout et Decne. Traité de Bot. 316 (1868), in obs. ; *l.c.* ed. Hook. f. 332 (1873 et 1876).—*Bursera mexicana* Engl. in DC. Monogr. 4, 51 (1883), quoad spec. Finck.—*Bursera tenuifolia* Engl. ex O. Kuntze, Rev. Gen. 1, 107 (1891).

A specimen in the Copenhagen herbarium (*Liebmann* 74) labelled "*Elaphrium elemiferum* Royle ex mss. Dr. Hanbury in herb. mus. Parisiensis" by L. Marchand led to a search for the name, which was not included in the *Index Kewensis*, with the result given above. Actually the Liebmann specimen is referable to *Bursera bipinnata*, but a plant which is evidently equal to Royle's type is in the Kew herbarium. It is the Finck specimen from Cordova, which Engler included in his *B. mexicana*. This plant was distributed by

Dr. Hanbury, and there are two good sheets at Kew, one at the Natural History Museum, and (by inference from Marchand's label in the Copenhagen herbarium) one at Paris.

Most of the leaves of the Kew specimen are simply pinnate, but a distinct tendency to the bipinnate condition can be traced. The Natural History Museum sheet shows that condition very well indeed. Apart from this character, the plant might be mistaken for *B. penicillata*, but the mature leaves are almost glabrous, and always lack the tufts of penicillate hairs at the "nodes" of the leaf rachis characteristic of that species. From *B. bipinnata* it can be distinguished by the much larger leaflets with more or less toothed margins and a strong tendency to acutely acuminate apices.

STATE OF OAXACA: Cordova, April\* 1865 (fl. and young fr.), *Finck* s.n.

***Bursera excelsa*** (H.B.K.) *Engl.* in DC. Monogr. 4, 57 (1883), et in *Engl. et Prantl, Nat. Pflanzenfam.* 3, 4, 251 (1896). *Elaphrium excelsum* H. B. K. Nov. Gen. et Sp. 7, 30, t. 611 p.p. (1824); Rose in N. Amer. Fl. 25, 257 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923). *Terebinthus excelsa* (H.B.K.) W. F. Wight ex Rose in Contr. U.S. Nat. Herb. 10, 119 (1906).—*Bursera Palmeri* S. Wats. in Proc. Amer. Acad. 22, 402 (1887); Rose in Contr. U.S. Nat. Herb. 1, 313 (1895), et *l.c.* 5, 113 (1897); Riley in Kew Bull. 1923, 168. *Terebinthus Palmeri* (S. Wats.) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Elaphrium Palmeri* (S. Wats.) Rose in N. Amer. Fl. 25, 255 (1911).—*Elaphrium queretarensense* Rose in N. Amer. Fl. 25, 254 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923). *Bursera queretarensis* (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 4, 217 (1929).—*Bursera acutidens* Sprague et Riley in Kew Bull. 1923, 169.—*Bursera sphaerocarpa* Sprague et Riley, *l.c.* 170.

The type material of *Elaphrium excelsum* is in the Humboldt and Bonpland herbarium in Paris, but by the courtesy of the authorities there I have seen a photograph of the type specimen, and a small part of a leaf, detached and sent on loan to Kew. These, together with the other material cited below, have been sufficient to enable me to extend the synonymy given and suggested by Standley.

Fruiting material shows great variation in the size and shape of the seed, but transitional forms between extremes indicate that no reliance can be placed on this character. All, however, are more or less rounded, none showing acute angles or pointed apices; the variation observed refers more to relative length and breadth than to any distinct difference in form.

The amount of indumentum, and the texture of the leaves, varies considerably. This variation can, however, be co-related

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\* It is not clear whether "April" on the label indicates the month of collection or of distribution. Since 1865 is the year of collection, however, it seems impossible that the plant could have been collected earlier, sent to England and redistributed by that month.—A.A.B.

with differences in environment, age of the leaves, and vigour of the branches bearing them. The toothing of the wings of the leaf-rachis is not a character on which any reliance can be placed.

As indicated below, *B. excelsa* is very widely distributed, and like most widely spread species, varies considerably in almost all characters. It is closely allied to the almost equally variable *B. jorullensis*, from which it constantly differs in its comparatively smooth, not rugose, leaves.

STATE OF DURANGO: Near Durango, April–Nov. 1896 (fl.), Palmer 170, 308.

STATE OF JALISCO: Rio Blanco, in deep cañons, June–Oct. 1886 (fr.), Palmer 609 (type collection of *B. Palmeri*).

STATE OF COLIMA: Kerber 308 (B); Manzanillo, Dec. 1890 (fr.), Palmer 987 (type of *B. acutidens*).

STATE OF GUERRERO: Venta del Exido, Humboldt and Bonpland 3890 (P; type); near Acapulco, Oct.–March 1894–5 (fr.), Palmer 432 (type of *B. sphaerocarpa*).

STATE OF OAXACA: San Bartolo Yauhtepec, Jan. 1896, Seler 1648 (B).

STATE OF VERA CRUZ: Gualulu, Oct. 1842 (fr.), Liebmann 82 (C); Pochutla, Oct. 1842 (fr.), Liebmann 81 (C).

STATE OF QUERETARO: Near Queretaro, Aug. 1906 (fr.), Rose and Rose 11153 (U; type of *Elaphrium queretarense*).

Probably also in Guatemala (Heyde and Lux 3036, distributed as *B. Palmeri* S. Wats).

**Bursera fagaroides** (H.B.K.) Engl. in Engl. Bot. Jahrb. 1, 44 (1881), et in DC. Monogr. 4, 48 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 249, fig. 146 A (1896); T. S. Brandeg. in Proc. Calif. Acad. Ser. 2, 3, 120 (1891); O. Kuntze, Rev. Gen. 107 (1891). *Elaphrium fagaroides* H.B.K. Nov. Gen. et. Sp. 7, 27, t. 611 (1824); Schlecht. in Linnaea, 17, 245 (1843); Rose in N. Amer. Fl. 25, 251 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 550 (1923). *Amyris fagaroides* (H.B.K.) Spreng. Syst. Veg. 4, Cur. Post. 148 (1827). *Terebinthus fagaroides* (H.B.K.) Rose in Contr. U.S. Nat. Herb. 10, 119 (1906).—*Bursera obovata* Turcz. in Bull. Soc. Nat. Mosc. 36, 1, 614 (1863); Engl. in DC. Monogr. 4, 59 (1883), sub. spp. dub. *Elaphrium obovatum* (Turcz.) Rose in N. Amer. Fl. 25, 245 (1911).—*Bursera Schaffneri* S. Wats. in Proc. Amer. Acad. 22, 469 (1887). *Terebinthus Schaffneri* (S. Wats.) Rose in Contr. U.S. Nat. Herb. 10, 122 (1906). *Elaphrium Schaffneri* (S. Wats.) Rose in N. Amer. Fl. 25, 245 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 546 (1923).—*Bursera aptera* Ramirez, Dat. Mat. Med. Mex. 1, 379, cum fig. (1894), et Estud. Hist. Nat. Mex. 119 (1904), et in An. Inst. Med. Nat. 2, 16, t. 1 (1896); Rose in Contr. U.S. Nat. Herb. 5, 113 (1897). *Terebinthus aptera* (Ramirez) Rose in Contr. U.S. Nat. Herb. 10, 118 (1906). *Elaphrium apterum* (Ramirez) Rose in N. Amer. Fl. 25, 249 (1911).—*Bursera Purpusii* T. S. Brandeg. in Zoe, 5, 249 (1908). *Elaphrium Purpusii* (T. S. Brandeg.) Rose in



N. Amer. Fl. **25**, 249 (1911).—*Elaphrium Covillei* Rose in N. Amer. Fl. **25**, 250 (1911).—*Bursera odorata* T. S. Brandeg. in Proc. Calif. Acad. Ser. 2, **2**, 138 (1889). *Terebinthus odorata* (T. S. Brandeg.) Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906). *Elaphrium odoratum* (T. S. Brandeg.) Rose in N. Amer. Fl. **25**, 250 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923), partim.—*Amyris ventricosa* La Ll., et *Amyris crenata* Willd.; ex Schlecht. in Linnaea, **17**, 245 (1843), in syn.

I have considered necessary some rearrangement of the plants included by Standley under the names *Elaphrium fagaroides* and *E. odoratum*, his conception of the latter being too wide, and of the former too narrow, to fit the increased representation of these plants at Kew. The fact that *E. odoratum* appears three times in Standley's key gives some idea of the range of variation allowed by him. The diagnostic character for *E. fagaroides*, "Leaflets finely crenate along almost the whole margin", I do not regard as sufficient; it merely separates extreme forms, one of which was figured in the original place of publication. The species as here understood varies from this to forms in which the leaflets are entire or nearly so; but always the leaf apex is obtuse or rounded, and the base cuneate. The leaf-rachis is either very narrowly winged or entirely devoid of wings. The very dark, reddish bark is characteristic.

It may be noted that Brandegee himself reduced his *B. odorata* to *B. fagaroides*.

STATE OF MEXICO: District of Temascaltepec; Bejucos, 610 m., July 1933, *Hinton* 4286; *ibid.* Aug. 1935 (fr.), *Hinton* 7744; Pungaranchito, July 1934 (young fr.), *Hinton* 6369; Naranjo, Feb. 1935 (fr.), *Hinton* 7394; Limones, June 1935 (fl.), *Hinton* 7839.

STATE OF SONORA: About six miles west of Torres, Feb. 1903 (fr.), *Coville* 1640 (U; type of *Elaphrium Covillei*).

STATE OF JALISCO: Rocky bluffs of Rio Grande de Santiago, near Guadalajara, Oct. 1889 (fr.), *Pringle* 2334; near Guadalajara, Sept. 1903 (fr.), *Rose and Painter* 7442 (C);

STATE OF MICHOACAN: District of Huetamo; Santa Cruz, Jan. 1934 (fr.), *Hinton* 5525; Mal Paso, Dec. 1934 (fr.), *Hinton* 7122; *ibid.* Jan. 1935 (fr.), *Hinton* 7272.

STATE OF GUERRERO: District of Coyuca; Coyuca, Nov. 1934 (fr.), *Hinton* 6899; *ibid.* June 1935, *Hinton* 7866; Tario, June 1935 (fl.), *Hinton* 7859 A; Cuahuilote, June 1935 (fl.), *Hinton* 7842; Pungarabato, June 1934 (fl.), *Hinton* 6126; *ibid.* Oct. 1934 (fr.), *Hinton* 6896; *ibid.* June 1935 (fl.), *Hinton* 7853; Pochote, June 1935 (fl.), *Hinton* 7878.

STATE OF MORELOS: Limestone hills near Jojutla, 100 m. (approx.), Oct. 1902 (fr.), *Pringle* 8700 (B).

STATE OF PUEBLA: Near Tehuacan, Aug. 1897 (fr.), *Pringle* 7502 (B); May 1842 (young fr.), *Liebmann* 25 (C); Tehuacan, May 1842, *Liebmann* 24 (C).

STATE OF VERA CRUZ: Barranca de Zacuapan, June 1906 (young fr.), *Purpus* 2045 (U; type collection of *B. Purpusii*).

STATE OF QUERETARO : Queretaro, *Bonpland* 4200 (B ; " ex herb. Humboldt." ; type collection).

STATE OF TAMAULIPAS : Tanmave, 620 m., Dec. 1930 (fr.), *Viereck* 822 (B).

STATE OF SAN LUIS POTOSI : " In montibus Morales," 1876 (fr.), *Schaffner* 90 (U ; type of *B. Schaffneri*).

Without locality : *Viereck* 483 (B) ; *Uhde* 1183 (B) ; *Schaffner* s.n. (B) ; " Leon," 1839 (fl.), *Hartweg* 260.

***Bursera filicifolia*** T. S. Brandeg. in *Zoe*, 5, 248 (1908). *Elaphrium filicifolium* (T. S. Brandeg.) Rose in N. Amer. Fl. 25, 254 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 551 (1923).

Brandegee allies this with *B. laxiflora*, and from his description and notes, I suspect that it is no more than a form of that species. Only the fact that he says the leaves sometimes resemble those of the fern *Cheilanthes tomentosa* induces me to maintain it as a species.

LOWER CALIFORNIA : Rancho Colorado, *Brandegee* (type in Herb. Univ. Calif. ; not seen).

***Bursera Galeottiana*** Engl. in Engl. Bot. Jahrb. 1, 43 (1881) , et in DC. Monogr. 4, 47 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 249 (1896) ; Rose in Contr. U.S. Nat. Herb. 5, 114 (1897). *Terebinthus Galeottiana* (Engl.) Rose in Contr. U.S. Nat. Herb. 10, 119 (1906). *Elaphrium Galeottianum* (Engl.) Rose in N. Amer. Fl. 25, 249 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 549 (1923).

STATE OF OAXACA : Monte Alban, near Oaxaca, Nov. 1894 (fr.), *Pringle* 6071 (B, K) ;

STATE OF PUEBLA : Tlacuiloltepec, near San Luis Tultitlanapa, May 1909 (fl.), *Purpus* 4067 (B) ; Tehuacan, June 1840 (fl.), *Galeotti* 4004 (type in herb. Deless.), 4084 (K).

It seems probable that the number 4084 on the Kew sheet of the Galeotti specimen is an error for 4004 ; the two specimens are similar in every respect.

***Bursera glabrifolia*** (H.B.K.) Engl. in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896), excl. syn. *Elaphrium glabrifolium* H.B.K. Nov. Gen. et Sp. 7, 28 (1825) ; Schlecht. in Linnaea, 17, 249 (1843) ; Rose in N. Amer. Fl. 25, 251 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923), in obs.—*Amyris Linanoë* La. Ll. in Reg. Trim. 1, 356 (1832).—*Elaphrium Aloëxylon* Schiede ex Schlecht. in Linnaea, 17, 252 (1843) ; Rose in N. Amer. Fl. 25, 255 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 551 (1923) ; Martinez, Pl. Ut. Republ. Mex. 255, cum fig. (1928). *Bursera Aloëxylon* (Schiede ex Schlecht.) Engl. in Engl. Bot. Jahrb. 1, 44 (1881), et in DC. Monogr. 4, 52 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896) ; Martinez, Las Pl. Med. Mex. 411 (1933), cum bibliogr. *Terebinthus Aloëxylon* (Schiede ex Schlecht.) W. F. Wight ex Rose in Contr. U.S. Nat. Herb. 10, 118 (1906).—*Amyris Linaloë* La Ll. in La Naturaleza, 7, Apénd. 73 (1885).—*Bursera*

*Schiedeana* Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 57 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896). *Terebinthus Schiedeana* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium Schideanum* (Engl.) Rose in N. Amer. Fl. **25**, 256 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923).—*Bursera Nelsoni* Rose in Contr. U.S. Nat. Herb. **3**, 314 (1895), et l.c. **5**, 113 (1897). *Terebinthus Nelsoni* (Rose) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909). *Elaphrium Nelsoni* (Rose) Rose in N. Amer. Fl. **25**, 251 (1911).

The synonymy given here presents an entirely new conception of *Bursera glabrifolia*, a portion of the type of which I have examined, together with a photograph of the type specimen, which is in the Humboldt and Bonpland Herbarium in Paris. The material available for study, however, is still inadequate, and some slight transposition of the specimens cited, between this species and *B. penicillata* (q.v.) may still be necessary. This will not, however, have a very great effect on the conception of the two species as here understood.

The epithet "*glabrifolia*" is a misnomer. I have seen no specimen with glabrous leaves, and in most cases these are fairly densely pubescent. The upper surface of the leaves often becomes shiny in age, giving a false impression that the surface is glabrous.

STATE OF MEXICO: District of Temascaltepec; Temascaltepec, Oct. 1934 (fr.), *Hinton* 6790; Ypericones, May 1935 (fl.), *Hinton* 7832.

STATE OF PUEBLA: Atlixco, July–Aug. 1893, *Nelson* s.n. (U; type of *B. Nelsoni*).

STATE OF MICHOACAN: Ario, between Patzcuaro and Jorullo, *Humboldt and Bonpland* 4328 (P; type); Jorullo, "ad latera m. ign.," Dec. 1829, *Schiede* s.n. (B); *ibid.* Dec. 1829, *Schiede* 1025 (B), 1029 (B).

STATE OF OAXACA: May 1842, *Liebmann* 80 (C); *Galeotti* 4006 (B, K).

STATE OF MORELOS: Near Huantla (Cuantla?), Nov. 1836, *Schiede* s.n. (B; type of *B. Schiedeana*).

Without locality: *Uhde* 1181 (B).

***Bursera grandifolia* (Schlecht.) Engl.** in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 45 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Elaphrium grandifolium* Schlecht. in Linnaea, **17**, 249 (1843); Rose in N. Amer. Fl. **25**, 246 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923). *Terebinthus grandifolia* (Schlecht.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Balsamodendrum Liebmannii* L. Marchand MS. in herb. mus. bot. Haun.—*Bursera cinerea* Engl. in DC. Monogr. **4**, 43 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Terebinthus cinerea* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).

*Elaphrium cinereum* (Engl.) Rose in N. Amer. Fl. **25**, 245 (1911).—*Elaphrium occidentale* Rose in N. Amer. Fl. **25**, 246 (1911). *Bursera occidentalis* (Rose) Riley in Kew Bull. 1923, 168.

The pubescence of the drupes is a constant character in this species, but flowering material can be distinguished by a certain quality of the indumentum, which becomes apparent only after examination of a long series of specimens. The pubescent ovary serves also to distinguish it, but many of the specimens seen are entirely male, and the flowers contain only a rudimentary ovary which appears to be quite glabrous.

STATE OF MEXICO : District of Temascaltepec ; Bejucos, 610 m., June 1932 (fl.), *Hinton* 921 ; Anonas, 880 m., April 1933 (young fl.), *Hinton* 3804 ; *ibid.* Nov. 1933 (fr.), *Hinton* 5213 ; *ibid.* Oct. 1935 (fr.), *Hinton* 8533 ; Acatitlán, April 1935 (fl.), *Hinton* 7654, 7655, 7657 ; Cañitas, May 1935 (fl.), *Hinton* 7737 ; Palmar, May 1935 (fl.), *Hinton* 7773 ; Villa Neda, May 1935 (fl. and young fr.), *Hinton* 7802 ; Ixtapan, 1000 m., May 1933 (fl.), *Hinton* 3910 ; *ibid.* May 1935 (fl.), *Hinton* 7822 ; Limones, June 1935 (fl.), *Hinton* 7888. Rincón del Carmen, May 1933 (fl.), *Hinton* 3927 ; *ibid.* March 1935 (fr.), *Hinton* 7518 ; *ibid.* May 1935 (fl. and fr.), *Hinton* 7724 ; Vigas, April 1935 (fl.), *Hinton* 7662 ; Tejupilco, April 1935 (fl. and fr.), *Hinton* 7626 ;

STATE OF SINALOA : Mazatlan, 50 m., (fl.), *Ortega* 5204 ; *ibid.* 1924 (fl.), *Ortega* 978.

STATE OF JALISCO : Barranca of Guadalajara, June 1898 (fl.), *Pringle* 7614 (B).

STATE OF COLIMA : Dec. 1880 (fr.), *Kerber* 349 (B).

STATE OF MICHOACAN : District of Huetamo ; Mal Paso, Dec. 1934 (fr.), *Hinton* 7123 ; Huetamo—San Lucas, Feb. 1934 (fr.), *Hinton* 5705.

STATE OF GUERRERO : District of Coyuca ; Placeres, June 1934 (fl.), *Hinton* 6110 ; Pungarabato, Nov. 1934 (fr.), *Hinton* 6933 ; *ibid.* Jan. 1935 (fr.), *Hinton* 7242 ; Cutzamala, May 1935 (fl.), *Hinton* 7767 ; Tario, June 1935 (fl.), *Hinton* 7864 ; Quirio, June 1935 (fl. and young fr.), *Hinton* 7870.

STATE OF OAXACA : Tintetlan del Cancino, May 1842 (fl.), *Liebmann* 69 (C ; type of *Balsamodendrum Liebmannii*) ; Valley of Cordova, (fl.), *Bourgeau* 2326 (B, type of *B. cinerea*).

STATE OF MORELOS : Cuernavaca, Sept. 1903 (fr.), *Rose and Painter* 6959 partim (C) ; *ibid.* lava fields, 1500 m., May 1898 (fl.), *Pringle* 6829 (K, B) ;

Without locality : " In reg. calid." (fr.), *Schiede* 1020 (B ; type).

*Bursera heterophylla* Engl. in DC. Monogr. **4**, 46 (1883) et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Terebinthus heterophylla* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium heterophyllum* (Engl.) Rose in N. Amer. Fl. **25**, 247 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 547 (1923).

This plant is very incompletely known, all the available material being young and inadequate. It is remarkable for the extremely rugose appearance of the flowering branches, due to the scars left by fallen leaves and inflorescences.

STATE OF MORELOS : Tlaquiltenango, *Ehrenberg* 1009 (B ; type).

Without locality : *Schiede* 1008 (B) ; *Ehrenberg* 1007 (B).

**Bursera Hindsiana** (*Benth.*) *Engl.* in DC. Monogr. 4, 58 (1883) ; et in Engl. et Prantl. Nat. Pflanzenfam. 3, 4, 251 (1896) ; T. S. Brandeg. in Proc. Calif. Acad. Ser. 2, 2, 138 (1889), et *l.c.* 3, 121 (1891). *Elaphrium Hindsianum* Benth. Bot. Voy. Sulph. 11, t. 8 (1844).—*Elaphrium rhoifolium* Benth. *l.c.* 10, t. 7 ; Rose in N. Amer. Fl. 25, 255 (1911). *Bursera Hindsiana* var. *rhoifolia* (Benth.) Engl. in DC. Monogr. 4, 59 (1883). *Terebinthus rhoifolia* (Benth.) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Bursera rhoifolia* (Benth.) I.M. Johnst. in Proc. Calif. Acad. Sc. Ser. 4, 12, 1058 (1924).—*Terebinthus MacDougalii* Rose in Torreya, 6, 170 (1906), teste Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923). *Elaphrium MacDougalii* (Rose) Rose in N. Amer. Fl. 25, 255 (1911).—*Elaphrium epinnatum* Rose in N. Amer. Fl. 25, 243 (1911), teste Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923).—*Elaphrium Goldmani* Rose in N. Amer. Fl. 25, 256 (1911), teste Standl. in Contr. U.S. Nat. Herb. 23, 552 (1911).—*Bursera nesopola* I. M. Johnst. in Proc. Calif. Acad. Sc. Ser. 4, 20, 66 (1931).

Engler was the first to combine *Elaphrium Hindsianum* and *E. rhoifolium* in one species, and his choice of the epithet *Hindsiana* is accordingly binding under International Rules, Art. 56.

LOWER CALIFORNIA : Magdalena Bay, *Hinds* 1843 (type) ; *ibid.* *Hinds* 1841 (type of *Elaphrium rhoifolium*) ; *ibid.* May 1925, *Mason* 1901 ; Tortuga Is., "... tree or shrub 8–12 ft. high. Only species of tree on the island," May 1921, *Johnston* 3597 ; Playa Maria, July–Oct. 1896, *Anthony* 81 ; San José del Cabo, 1890, *Brandege* (not seen).

STATE OF SONORA : Hills near the Gulf of California, Aug. 1884, *Pringle* s.n.

**Bursera Hintoni** *Bullock* sp. nov. ; ramulis valde crassis, foliis magnis pinnatis, foliolis 6–10-jugatis magnis grosse subdupliciter crenato-serratis, rachi late serrato-alata, inflorescentiis inter eas specierum mexicanarum maximis distincta ; a *B. excelsa* (H.B.K.) Engl. ramis crassioribus, foliis inflorescentiisque multo majoribus facile distinguenda.

*Frutex* vel arbor, 3–10 m. alta ; ramuli valde crassi, apicem versus 1–1.5 cm. diametro ; terminales laeves, internodiis elongatis, primum satis dense hirsuto-pilosi, demum glabri ; laterales internodiis valde abbreviatis, cicatricibus foliorum et inflorescentiarum delapsorum rugosi ; cortex laevis, glauco-ruber vel griseus. *Folia* imparipinnata, pro genere magna, apice ramulorum congesta, vel secus ramulos terminales elongatos alterna, petiolis usque ad

8 cm. longis basin versus vaginato-ampliat, interstitiis inter juga oblanceolato-alatis usque ad 4.5 cm. longis et 1.3 cm. latis marginibus serrato-crenatis, tota (petiolo incluso) usque ad 45 cm. longa, 20 cm. lata, juniora supra velutino-pubescentia, subtus tomentosa, adulta utraque pagina satis dense piloso-pubescentia (sed supra plus minusve nitida); foliola 6–10-jugata, lateralia subsessilia, late lanceolata vel ovato-lanceolata, apice acute acuminata, basi rotundata, usque ad 12.5 cm. longa, 5.5 cm. lata, inferiora minora; folium terminale plus minusve rhomboideo-ovatum, apice gradatim acuminatum, basi cuneatum, usque ad 13 cm. longum et 7 cm. latum; omnia marginibus grosse subacute subdupliciter crenato-serrata, subtus nervis lateralibus (utrinsecus 16–22) venulisque prominenter reticulata. *Thyrsi* pro genere maximi, ex axillis perularum orti, satis dense molliterque pilosi, toti circiter 20 cm. longi et usque ad 5 cm. lati; pedunculi 4–9 cm. longi sed interdum breviores; bracteae lineares vel filiformes, usque ad 1 cm. longae sed saepe minores. *Flores masculi*; sepala lanceolata, subacuta, 2.5–5 mm. longa, leviter inaequalia, extra pilosa; petala oblonga, apice obtusa, circiter 4 mm. longa, extra leviter pilosa, sepalis longiora vel breviora; stamina 8, filamentis subulato-filiformibus 2 mm. longis, antheris oblongis 1 mm. longis; discus annularis, carnosus, leviter crenatus; ovarium parvum, abortivum. *Flores feminei*; petala atque sepala similia; stamina 8, parva, filamentis subulatis, antheris sterilibus; ovarium ovoideum, 2 mm. longum, glabrum, stylo conico 0.5 mm. longo, stigmatibus capitato leviter 3-lobato. *Flores hermaphroditi* non visi. *Drupae* glabrae, obovoideo-ellipsoideae, circiter 1.3 cm. longae et 8 mm. diametro, demum dehiscentes, valvis 2 prius quam seminibus delabentibus. *Semina* subobovoidea, unilateraliter compressa, 8–9 mm. longa, 6 mm. lata, plerumque arillo aurantiaco omnino induta, sed interdum apice testa nigra leviter exserta.

STATE OF MEXICO: District of Temascaltepec; Bejucos, 610 m., "shrub 4 m., resin used for incense," May 1933 (fl.), *Hinton* 3952; San Lucas, "shrub 3 m.", July 1933 (fl. and young fr.), *Hinton* 4298; Cañitas, "tree 6 m. high, range 600–1400 m., not found below Bejucos," Nov. 1934 (fr.), *Hinton* 6991 (type); *ibid.* "tree 8 m.", May 1935 (fl. and young fr.), *Hinton* 7774; Villa Neda, "10 m. high," May 1935 (fl.), *Hinton* 7794; Limones, "tree 6 m.", June 1935 (young fr.), *Hinton* 7889.

Only two kinds of flowers have been seen, distributed as follows:—

(a) Inflorescence predominantly ♀, with some ♂ towards the apex.

(b) Inflorescence entirely ♂.

It is not possible to say whether this applies to the whole plant or to individual inflorescences.

The sepals are very variable in length in both male and female flowers, varying from just over half as long to a little longer than the petals, which are fairly constant in length. The stamens in ♀ flowers are fairly well developed but the anthers are reduced and

obviously sterile. In ♂ flowers one or two anthers are often sterile. In all flowers the filaments are of unequal length ; the differences are noticeable on dissection, but are scarcely measurable in the units in general use for taxonomic description. The affinities of *B. Hintoni* are undoubtedly with *B. excelsa* and its allies, from which it may be readily distinguished by the characters mentioned in the diagnosis above. The large inflorescence and infructescence is particularly noticeable, and also the relatively large number of drupes on each.

**Bursera jorullensis** (H.B.K.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 57 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251, fig. 146 N-O (1896), excl. syn. *Elaphrium jorullense* H.B.K. Nov. Gen. et Sp. **7**, 22, t. 612 (1825) ; Schlecht. in Linnaea, **17**, 628 (1843) ; Rose in N. Amer. Fl. **25**, 256 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923) ; Ramirez, Pl. Ut. Republ. Mex. 116, cum fig. (1928), et Las Pl. Med. Mex. 366 cum bibliogr. (1933). *Amyris jorullensis* (H.B.K.) Spreng. Syst. Veg. **4**, Cur. Post. 149 (1827). *Terebinthus jorullensis* (H.B.K.) W. F. Wight ex Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Amyris rugosa* Willd. ex Schlecht. in Linnaea, **17**, 628 (1843), in syn. ; Engl. in DC. Monogr. **4**, 58 (1883), in syn.—*Elaphrium lanuginosum* H.B.K. Nov. Gen. et Sp. **7**, 31 (1825) ; Schlecht. in Linnaea, **16**, 528 (1842) ; Rose in N. Amer. Fl. **25**, 256 (1911). *Amyris lanuginosa* (H.B.K.) Spreng. Syst. Veg. **4**, Cur. Post. 149 (1827). *Bursera lanuginosa* (H.B.K.) Engl. in DC. Monogr. **4**, 58 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896) ; Rose in Contr. U.S. Nat. Herb. **5**, 114 (1897). *Terebinthus lanuginosa* (H.B.K.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Elaphrium cuneatum* Schlecht. in Linnaea, **17**, 629 (1843) ; Rose in N. Amer. Fl. **25**, 257 (1911) ; Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923). *Bursera cuneata* (Schlecht.) Engl. in Engl. Bot. Jahrb. **1**, 44 (1881), et in DC. Monogr. **4**, 56 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 251 (1896). *Terebinthus cuneata* (Schlecht.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906).—*Bursera Palmeri* var. *glabrescens* S. Wats. in Proc. Amer. Acad. **25**, 145 (1890).—*Bursera glabrescens* (S. Wats.) Rose in Contr. U.S. Nat. Herb. **3**, 313 (1895), et l.c. **5**, 113 (1897). *Terebinthus glabrescens* (S. Wats.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium glabrescens* (S. Wats.) Rose in N. Amer. Fl. **25**, 256 (1911).

Specimens of this species collected at different seasons tend to present totally different aspects, mainly connected with the rugosity of the upper leaf-surface, and the amount of indumentum on the lower surface. Most of the reductions listed above are confirmations of Standley's opinions, but the reduction of *Elaphrium cuneatum* may perhaps give rise to some argument. It is possible to trace, however, an unbroken series of gradations in both the shape of the leaflet-base, and in the amount of indumentum, between the types of *Elaphrium jorullense* (base of leaflets rounded) and *Elaphrium*

*cuneatum* (base of leaflets cuneate). As this is the only character by which the two types can be distinguished with certainty, I have had to reduce Schlechtendal's later species.

STATE OF MEXICO : District of Temascaltepec ; Tejupilco, on a hill, "shrub 2 m.", Dec. 1934 (fr.), *Hinton* 7078 ; Volcán, on a hill, "2 m. high", Feb. 1935 (fr.), *Hinton* 7331 ; Guadalupe, Vallée de Mexico, June 1865 or 1866 (fr., fl.), *Bourgeau* 338 (K, B, C, P) ; *ibid.* Oct. 1867 (fr.), *Bilimek* 85 ; *ibid.* Sept. 1903, (fr.), *Rose and Painter* 7302 (C).

STATE OF JALISCO : Rio Grande de Santiago, near Guadalajara, on rocky bluffs, Oct. 1889 (fr.), *Pringle* 2335 (K, B) ; Guadalajara, on bluffs of the barranca, May 1891 (young fl.), *Pringle* 3707 (B) ; *ibid.* Sept. 1891 (fr.), *Pringle* 4032 (B).

STATE OF MICHOACAN : Ad radices montis Jorullo, *Schiede* 36 (locus classicus) ; *ibid.* *Schiede* s.n. (B) ; "San Salvador," 1908, *Gadow*\* s.n.

STATE OF GUERRERO : Near Balsas, 1905 (fr.), *Lemmon* 188 (K, B) ; near Taxmalac, *Seler* 4274 (B) ; Chilapa, Nov. 1929, *Schultze Jena* 242 (B).

STATE OF MORELOS : Hillsides near Cuernavaca, 1500 m., "a small tree," Nov. 1895 (fr.), *Pringle* 6208 (K, B) ; *ibid.* *Humboldt and Bonpland* 3989 (P) ; near Chapultepec, District of Cuernavaca, 1450 m., Dec. 1905, *Endlich* 1085 (B).

Without exact locality : *Arsène* 2736 (B) ; *Schmits* 710 (B. ex herb. Vindob.) ; *Ehrenberg* s.n. (B).

***Bursera Karwinskii*** *Engl.* in DC. Monogr. **4**, 43 (1883), et in *Engl. et Prantl*, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Terebinthus Karwinskii* (Engl.) *Rose* in Contr. U.S. Nat. Herb. **10**, 119 (1906) ; *Elaphrium Karwinskii* (Engl.) *Rose* in N. Amer. Fl. **25**, 248 (1911) ; *Standl.* in Contr. U.S. Nat. Herb. **23**, 546 (1923).

The portion of the type at Berlin is a mere scrap, but it is sufficient to show that this species is very near to *B. sessiliflora*. Its status as a species is uncertain.

STATE OF QUERETARO : Toliman, *Karwinski* (B ; type collection).

***Bursera lancifolia*** (*Schlecht.*) *Engl.* in *Engl. Bot. Jahrb.* **1**, 43 (1881), et in DC. Monogr. **4**, 42 (1883), et in *Engl. et Prantl*, Nat. Pflanzenfam. **3**, 4, 249 (1896). *Elaphrium lancifolium* *Schlecht.* in *Linnaea*, **17**, 247 (1843) ; *Rose* in N. Amer. Fl. **25**, 248 (1911) ; *Standl.* in Contr. U.S. Nat. Herb. **23**, 546 (1923). *Terebinthus lancifolia* (*Schlecht.*) *W. F. Wight* ex *Rose* in Contr. U.S. Nat. Herb. **10**, 120 (1906).—*Bursera fragilis* *S. Wats.* in Proc. Amer. Acad. **21**, 422 (1886) ; *Rose* in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus fragilis* (*S. Wats.*) *Rose* in Contr. U.S. Nat. Herb. **10**,

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\* For an account of the vegetation and fauna, together with the history, of the Jorullo volcanoes, see Dr. Hans Gadow's book "Jorullo", published in 1930 by the University Press, Cambridge.



119 (1906). *Elaphrium fragile* (S. Wats.) Rose in N. Amer. Fl. **25**, 252 (1911).—*Bursera trijuga* Ramirez, Dat. Mat. Med. Mex. **1**, 380, cum fig. (1894), et in Anal. Inst. Med. Nac. **2**, 16 (1896), et Estud. Hist. Nat. **120** (1904); Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897). *Terebinthus trijuga* (Ramirez) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909). *Elaphrium trijugum* (Ramirez) Rose in N. Amer. Fl. **25**, 248 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923); Martinez, Las Pl. Med. Mex. **371**, cum fig. (1934).—*Elaphrium Tecomaca* Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923), partim, non *Amyris Tecomaca* DC. (1825), nec *Bursera Tecomaca* (DC.) Standl. (1929), nec *Amyris sylvatica* Sessé et Moc. (1894) [non Jacq. (1763)].

The new identification of *Amyris Tecomaca* DC. is recorded on page 377; less discontinuous geographical distributions are thus obtained than by following Standley's identification of the Sessé and Mociño figure\* on which it was based.

Both Rose and Standley suggest Vera Cruz as the type locality for Schiede's plants, one of which is the type, but there seems to be no reason why it should not have been collected from a point much further north.

STATE OF CHIHUAHUA: Hacienda San Miguel, near Batopilas, South-western Chihuahua, Aug.-Sept. 1885 (fr.), Palmer W (K; type collection of *B. fragilis*).

Without exact locality: "In reg. calid." (fr.), Schiede 998, 1021 (B); 1905 (fr.), Lemmon 191 (K, B).

*Bursera laxiflora* S. Wats. in Proc. Amer. Acad. **24**, 44 (1889); Rose in Contr. U.S. Nat. Herb. **1**, 313 (1895); Engl. in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 249 (1896); Rose in Contr. U.S. Nat. Herb. **5**, 113 (1897); T.S. Brandeg. in Zoe, **5**, 204 (1905); Riley in Kew Bull. 1923, 168; Loes. in Fedde, Repert. Sp. Nov. **12**, 224 (1924). *Terebinthus laxiflora* (S. Wats.) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909). *Elaphrium laxiflorum* (S. Wats.) Rose in N. Amer. Fl. **25**, 253 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923).—*Bursera concinna* Sandw. in Kew Bull. 1926, 434.

I have not seen *B. filicifolia* (q.v.) but from the description and Brandege's remarks, I strongly suspect that it is no more than a form of this plant. For the present, however, it is listed as a separate species.

*B. laxiflora*, especially the form formerly separated as *B. concinna*, recalls *B. stenophylla*, a plant with bipinnate leaves. As in that species, the seeds are only about half-covered by the fleshy aril-like pulp, and a probable hybrid origin of *B. stenophylla* is at once suggested.

STATE OF SONORA: Guaymas, Oct. 1887 (fr.), Palmer 280 (K, C, U; type collection).

STATE OF SINALOA: Agiabampo, 1890 (fr.), Palmer 797 (K, B); Ahome, Ortega 5567 (type of *B. concinna*).

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\* Alph. DC. Calq. Dess. t. 195 (1875).

***Bursera longipedunculata* (Rose) Standl.** in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 4, 217 (1929). *Elaphrium longipedunculatum* Rose in N. Amer. Fl. 25, 254 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923).

Apparently this is a distinct species, but the material seen is too inadequate for complete assurance that it is not a form of *Bursera graveolens* Triana et Planch., a widely spread and very variable South American species. It is at any rate distinct from any other Mexican species.

STATE OF OAXACA: Almoloyas, District of Cuicatlán, Sept. 1906 (fr.), *Rose and Rose* 11282 (U; type); *ibid.* June 1908 (fr.), *Conzatti* 2194 (B).

Standley gives Puebla also for the distribution of this plant, but I have seen no specimens from that state.

***Bursera longipes* (Rose) Standl.** in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 4, 217 (1929). *Terebinthus longipes* Rose in Contr. U.S. Nat. Herb. 10, 120 (1906). *Elaphrium longipes* (Rose) Rose in N. Amer. Fl. 25, 246 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 547 (1923).

STATE OF OAXACA: near Cafetal Concordia, 400–650 m., April, 1933 (fr.), *Morton and Makrinius* 2501.

STATE OF MORELOS: Near Jojutla, May 1901 (fl. and young fr.), *Pringle* 8510 (U, B, C, K).

STATE OF PUEBLA: Matamoros, June 1899, *Rose and Hough* 4691 (U; type).

Another specimen at Kew, from either Michoacan or Guerrero, may belong here (*Langlássé* 1032).

***Bursera microphylla* A. Gray** in Proc. Amer. Acad. 5, 155 (1861) et *l.c.* 17, 230 (1882); Engl. in DC. Monogr. 4, 47 et 537 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 249 (1896); T.S. Brandeg. in Proc. Calif. Acad. Ser. 2, 3, 121 (1891). *Terebinthus microphylla* (A. Gray) Rose in Contr. U.S. Nat. Herb. 10, 120 (1906). *Elaphrium microphyllum* (A. Gray) Rose in N. Amer. Fl. 25, 250 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 548 (1923).—*Bursera morelensis* Ramirez in Anal. Inst. Med. Nac. Mex. 2, 17, t. 3 (1896); Rose in Contr. U.S. Nat. Herb. 5, 113 (1897). *Terebinthus morelensis* (Ramirez) Rose in Contr. U.S. Nat. Herb. 10, 120 (1906). *Elaphrium morelense* (Ramirez) Rose in N. Amer. Fl. 25, 250 (1911).—*Terebinthus multifolia* Rose in Contr. U.S. Nat. Herb. 10, 120 (1906). *Elaphrium multifolium* (Rose) Rose in N. Amer. Fl. 25, 250 (1911).

The leaves of *B. microphylla* (type) have fewer leaflets than the Pringle specimen of *B. morelensis*, and more than those of *B. arida* (q.v.). The exact status of each, and the characters which separate them from *B. Galeottiana* (q.v.), are not by any means clear. More material of each, and field observations on their variability, are required. The distribution suggests that *B. morelensis* and *B. microphylla* might be distinct, but I can find no character except the number of leaflets to separate them.

LOWER CALIFORNIA : Cape St. Lucas, Aug. 1859-Jan. 1860 (fr.), *Xantus* 21 ; Carmen Is., Nov. 1890 (fr.), *Palmer* 884 ; San Pedro Novasco Is., April 1921, *Johnston* 3128 ; Tiburon Is., July 1921 (fl.), *Johnston* 4273 ; San Estaban Is., April 1921, *Johnston* 3186 ; Coyote Bay, Concepcion Bay, June 1921, *Johnston* 4168 ; Magdalena Bay, May 1925 (fr.), *Mason* 1922.

STATE OF SONORA : Guaymas, 1887 (fl.), *Palmer* 163 ; Sierra Tulé, *Schott* (U ; not seen).

STATE OF MORELOS : Near Jojutla, Oct. 1902 (fr.), *Pringle* 8699 (K, B, C ; distrib. as *B. morelensis*)

Also in Arizona (*Pringle* s.n. in herb. Kew.).

***Bursera multijuga*** Engl. in DC. Monogr. 4, 42 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 249 (1896). *Terebinthus multijuga* Engl.) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Elaphrium multijugum* (Engl.) Rose in N. Amer. Fl. 25, 248 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 546 (1923).—*Bursera Pringlei* S. Wats. in Proc. Amer. Acad. 25, 145 (1890) ; Rose in Contr. U.S. Nat. Herb. 5, 113 (1897). *Terebinthus Pringlei* (S. Wats.) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Elaphrium Pringlei* (S. Wats.) Rose in N. Amer. Fl. 25, 252 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 549 (1923).

*B. multijuga* is closely allied to *B. confusa*, from which it may be distinguished by its more numerous, narrower leaflets, and longer inflorescences.

Examination of the type specimens of *B. multijuga* and *B. Pringlei* leaves no doubt that they are conspecific ; only lack of opportunity to examine the type can have led Watson to describe Pringle's plant as new. The wide separation of *B. multijuga* and *B. Pringlei* in both Rose's and Standley's keys to the species, is due to the too free use of the characters "rachis winged" and "rachis unwinged," which breaks down completely in many instances, and has led to the description of several invalid species. In a manuscript note, Engler notes that a sheet of the type collection of *B. Pringlei* in the Berlin herbarium is "=*B. multijuga*." Mr. Hinton has collected *B. multijuga* only once, in a much younger state than any other specimens I have seen.

STATE OF MEXICO : Salitre-Cañitas, District of Temascaltepec, 1300 m., on a dry hill, "shrub 4 m., flower white", May 1933, *Hinton* 3939.

STATE OF JALISCO : Rio Grande de Santiago, near Guadalajara, on rocky bluffs, Oct. 1889 (fr.), *Pringle* 2336 (K, B ; type collection of *B. Pringlei*) ; Barranca of Guadalajara, 1500 m., on rocky bluffs, July 1902 (fl.), *Pringle* 9705 (K, B) ; near Zapotlan, on lava beds, "a small tree", May 1893 (fl.), *Pringle* 4381 (K, B) ; barranca of Guadalajara, 1350 m., "15-20 feet", June 1898 (very young fr.), *Pringle* 7554 (B). Without locality, but probably in the State of Jalisco, "Central Mexico, summer of 1893 (fr.), *Pringle* 4372 (B, ex herb. A. Gray.).

STATE OF COLIMA : June 1880 (fl.), *Kerber* s.n. (B, type).

Further exploration will most probably considerably extend the distribution of this species, at least to Michoacan and Guerrero.

***Bursera ovalifolia*** (Schlecht.) Engl. in Engl. Bot. Jahrb. **1**, 43 (1881), et in DC. Monogr. **4**, 40 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, 4, 248 (1896); Rose in Contr. U.S. Nat. Herb. **1**, 313 (1895), et *l.c.* 314. *Elaphrium ovalifolium* Schlecht. in Linnaea, **17**, 248 (1843); Rose in N. Amer. Fl. **25**, 246 (1911). *Terebinthus ovalifolia* (Schlecht.) Rose in Contr. U.S. Nat. Herb. **10**, 121 (1906).—*Terebinthus acuminata* Rose in Contr. U.S. Nat. Herb. **12**, 278 (1909), non *Bursera acuminata* Willd. (1806). *Elaphrium acuminatum* (Rose) Rose in N. Amer. Fl. **25**, 247 (1911). —*Elaphrium Simaruba* Standl. in Contr. U.S. Nat. Herb. **23**, 547 (1923) partim, quoad syn., non *Pistacia Simaruba* L. (1753).

I have seen only a scrap of the type specimen of *B. ovalifolia* from Engler's herbarium at Berlin, but this, taken in conjunction with the published descriptions, leaves no doubt that the specimens cited below are conspecific. *B. ovalifolia* is distinguished from *B. Simaruba* (L.) Sarg. by only minor characters, of which the smaller fruits and somewhat emarginate apex of the acutely three-angled seeds are perhaps the most important; the seeds of *B. Simaruba* are acute, and the angles are rounded.

Mr. Hinton's number 7801 shows pedate division of the lowest leaflets. This has not, I believe, been observed previously.

STATE OF MEXICO : District of Temascaltepec; Las Vigas, 1080 m., in rocky places, June 1932 (fl.), *Hinton* 730; Volcán, 1530 m., on the edge of the crater, June 1933 (fl. and young fr.), *Hinton* 4084; Nanchititla, in oak woods, June 1934 (fl. and young fr.), *Hinton* 6141; Cañitas-Salitre, Jan. 1935 (fr.), *Hinton* 7299; Tejupilco, Dec. 1934 (fr.), *Hinton* 7140; *ibid.* Feb. 1935 (fr.), *Hinton* 7328; Acatitlán, Feb. 1935 (fr.), *Hinton* 7396; Ypericones, May 1935 (fl. and fr.), *Hinton* 7825; *ibid.* May 1935 (fl. and fr.) *Hinton* 7830, 7831; Villa Neda, May 1935 (fl. and fr.), *Hinton* 7801.\*

STATE OF JALISCO : Near Chapala, Oct. 1903 (fr.), *Rose and Painter* 7656 (U; type of *Terebinthus acuminata*).

STATE OF COLIMA : March 1891 (fr.), *Palmer* 1388 (B).

STATE OF MICHOACAN : Rock fields near Coru Station, Oct. 1904 (fr.), *Pringle* 8838.

STATE OF GUERRERO : Near Acapulco, Oct.–March 1894–5 (fr.), *Palmer* 378.

STATE OF VERA CRUZ (?) : Consoquitla, Oct. 1841 (fr.), *Liebmann* 66 (C).

STATE OF TAMAULIPAS : Near Tampico, Jan. 1910 (fr.), *Palmer* 67.

Without exact locality : *Schiede* s.n. (B; type collection).

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\* The specimens with flowers and fruit consist of young shoots with flowers and young leaves, and older stems with fruit of the previous year, except where otherwise stated.

***Bursera penicillata*** (Sessé et Moc. ex DC.) Engl. in Engl. Bot. Jahrb. 1, 44 (1881), et in DC. Monogr. 4, 52 (1883), partim, et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896) in syn. *Elaphrium penicillatum* Sessé et Moc. ex DC. in DC. Prodr. 1, 724 (1824); Alph. DC. Calq. Dess. tt. 203, xxxC (1875); Rose in N. Amer. Fl. 25, 253 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 549 (1923). *Amyris penicillata* (Sessé et Moc. ex DC.) Spreng. Syst. Veg. 2, 219 (1825). *Terebinthus penicillata* (Sessé et Moc. ex DC.) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906).—*Bursera mexicana* Engl. in DC. Monogr. 4, 51 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896), excl. spec. Finck. *Terebinthus mexicana* (Engl.) W. F. Wight ex Rose in Contr. U.S. Nat. Herb. 10, 120 (1906). *Elaphrium mexicanum* (Engl.) Rose in N. Amer. Fl. 25, 253 (1911).—*Bursera Delpechiana* Poiss. ex Engl. in DC. Monogr. 4, 53 (1883); Poiss. in Compt. Rend. Ass. France, Blois, "Sur le Linaloe", 1-7, t. x (1884)\*; Engl. in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896); Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923), sub spp. dub. *Terebinthus Delpechiana* (Poiss. ex Engl.) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Elaphrium Delpechianum* (Poiss. ex Engl.) Rose in N. Amer. Fl. 25, 253 (1911).

Great variation in the amount of indumentum present on individual specimens of this species tends to obscure the fact that they are conspecific. *B. Delpechiana* was regarded as doubtful by Standley, but the type material in the Paris and Berlin herbaria leaves no doubt that it is equal to Sessé and Mocino's plant. Engler did not attempt to separate them in his keys to the species, and the descriptions given by him are not mutually exclusive; his separation of them is no doubt due to the fact that he wrongly included *Elaphrium glabrifolium* H.B.K. in his *Bursera penicillata*. The former is here maintained as a distinct species under the name *Bursera glabrifolia*.

The Finck specimen included by Engler in his *B. mexicana* is distinct, having bipinnate leaves, and is here identified as *Bursera elemifera* (Royle) Baill.

STATE OF MEXICO: District of Temascaltepec; Tejupilco, 1340 m., May 1932 (fl.), Hinton 683; Temascaltepec, June 1935 (fl.), Hinton 7697; Ixtapan, May 1935 (fl.), Hinton 7728; Vigas, May 1935, Hinton 7734.

STATE OF JALISCO: Huejotitan, May 1912 (fl.), Diguett s.n. (K, P, B).

STATE OF COLIMA: Kerber s.n. (B).

STATE OF MORELOS: Cuantla, 1879 (fl.), Delpech s.n. (P, B; type of *B. Delpechiana*).

STATE OF PUEBLA: Tlacuiloltepec, May 1909 (fl.), Purpus 4070 (B).

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\* I have seen only a repaginated separate of this paper, without the plate.—A.A.B.

**Bursera rubra** (Rose) Riley in Kew Bull. 1923, 168. *Terebinthus rubra* Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Elaphrium rubrum* (Rose) Rose in N. Amer. Fl. 25, 252 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 550 (1923).

Rose states that "This species seems nearest *T. (Terebinthus) Pringlei* (= *B. multijuga*) but has shorter petioles and peduncle and much broader leaflets, etc."

STATE OF SINALOA: Near Colomas, July 1897 (fr.), Rose 1670 (U; type).

**Bursera Schlechtendalii** Engl. in DC. Monogr. 4, 41 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 248 (1896). *Terebinthus Schlechtendalii* (Engl.) Rose in Contr. U.S. Nat. Herb. 10, 122 (1906). *Elaphrium simplicifolium* Schlecht. in Linnaea, 16, 532 (1842); Rose in N. Amer. Fl. 25, 244 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 546 (1923); non *Bursera simplicifolia* DC. (1825).—*Bursera Jonesii* Rose in Contr. U.S. Nat. Herb. 3, 314 (1895), et l.c. 5, 113 (1897), teste Standl. in Contr. U.S. Nat. Herb. 23, 546 (1911). *Terebinthus Jonesii* (Rose) Rose in Contr. U.S. Nat. Herb. 10, 119 (1906). *Elaphrium Jonesii* (Rose) Rose in N. Amer. Fl. 25, 244 (1911).

This is another species of uncertain status. It is very incompletely known, and the specimens I have seen are mere scraps.

If it belongs to the genus *Bursera*, it is very distinct, and without near allies.

STATE OF VERA CRUZ (?): S. Augustin, Oct. 1842 (fr.), Liebmann 65 (C).

Without exact locality: "in reg. calid." Schiede 1022 (B; type number).

**Bursera sessiliflora** Engl. in DC. Monogr. 4, 55 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896). *Terebinthus sessiliflora* (Engl.) Rose in Contr. U.S. Nat. Herb. 10, 122 (1906). *Elaphrium sessiliflorum* (Engl.) Rose in N. Amer. Fl. 25, 254 (1911); Standl. in Contr. U.S. Nat. Herb. 23, 552 (1923), quoad nomen tantum.—*Bursera pannosa* L. Marchand ex Engl. in DC. Monogr. 4, 54 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896). *Terebinthus pannosa* (L. Marchand ex Engl.) Rose in Contr. U.S. Nat. Herb. 10, 121 (1906). *Elaphrium pannosum* (L. Marchand ex Engl.) Rose in N. Amer. Fl. 25, 254 (1911); Standl.\* in Contr. U.S. Nat. Herb. 23, 550 (1923).—*Elaphrium brachypodum* Rose in N. Amer. Fl. 25, 253 (1911).—*Elaphrium odoratum* Standl. in Contr. U.S. Nat. Herb. 23, 549 (1923), partim, quoad syn. *Elaphrium brachypodum* Rose (1911), non *Bursera odorata* T. S. Brandeg. (1889).

Standley's reduction of *B. asplenifolia* T. S. Brandeg. to this species is, I think, mistaken, and his notes and brief description

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\* Under this reference, Standley notes that he had not seen the plant, but he saw it in 1927, as the type specimen at Copenhagen is labelled over his signature in that year.

apply only to Brandegees's plant. As far as can be ascertained, *B. sessiliflora* has been known hitherto from the type collection only, no other specimens having been referred to it. *Elaphrium brachypodum* is certainly conspecific, and I am unable to find any difference of specific importance to separate *B. pannosa* from *B. sessiliflora*. In each case the type material is inadequate for thorough description, but the specimens collected by Mr. Hinton supply the deficiency. Engler placed his two species consecutively, and distinguished between them by means of leaf-characters which the new material shows to be valueless.

STATE OF MEXICO: District of Temascaltepec; Ocotepc, Nov. 1934 (fr.), *Hinton* 7037; Tejupilco, May 1934 (fr.), *Hinton* 6065; *ibid.* Sept. 1934, *Hinton* 6566; *ibid.* April 1935 (fl.), *Hinton* 7634; *ibid.* April 1935 (fl.), *Hinton* 7635; Villa Neda, May 1935 (fl.), *Hinton* 7798; Ixtapan, 1000 m., April 1935 (fl.), *Hinton* 7629; *ibid.* April 1933 (fl.), *Hinton* 3733, 3735; Tejupilco—San José, Dec. 1934 (fr.), *Hinton* 7084; Ypericones, Feb. 1935 (fr.), *Hinton* 7340; *ibid.* May 1935 (fl. and young fr.), *Hinton* 7828; Volcán, Dec. 1934 (fr.), *Hinton* 7161; Pantoja, April 1935 (fl. and young fr.), *Hinton* 7645; Platanal, Oct. 1934 (fr.), *Hinton* 6741; San Lucas, April 1935 (fl.), *Hinton* 7649; *ibid.* April 1935 (fl.), *Hinton* 7651, 7652; Temascaltepec, May 1932 (fl.), *Hinton* 814; *ibid.* Oct. 1934 (fr.), *Hinton* 6787; *ibid.* May 1935 (fl.), *Hinton* 7682; *ibid.* June 1935 (fr.) *Hinton* 7705; Pungaranchó, April 1933 (fl.), *Hinton* 3749; *ibid.* Oct. 1935 (fr.), *Hinton* 8571.

STATE OF JALISCO: Near Etzatlan, Oct. 1903 (fr.), *Rose and Painter* 7534 (U; type of *Elaphrium brachypodum*).

STATE OF GUERRERO: Near Chilapa, Nov. 1929 (fr.), *Schultze Jena* 241 (B).

STATE OF VERA CRUZ: San Felipe, Mirador, May 1842 (fl.), *Liebmänn* 78 (C; type of *B. pannosa*).

Without exact locality: *Karwinski* s.n. (B, ex herb. Monac.; type).

***Bursera stenophylla* Sprague et Riley** in Kew Bull. 1923, 169.

This is a very close ally of *B. bipinnata*, only separated from it by means of leaf characters of doubtful value, the longer infructescence, and the smaller aril. It is, however, very different in general appearance, the leaflets recalling those of some forms of *B. laxiflora* (q.v.), thus suggesting that it is of hybrid origin.

STATE OF CHIHUAHUA: Hacienda San Miguel, Aug.–Nov. 1885 (fr.), *Palmer* 200 (type).

STATE OF SINALOA: Choix, Las Jicaras, 500 m., *Gonzalez* 894.

Without exact locality: Dec. 1904, *Endlich* 786 (B);

***Bursera submoniliformis* Engl.** \* in DC. Monogr. 4, 55 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. 3, 4, 251 (1896); Rose in

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\* This epithet was first used in MS. by L. Marchand (under *Elaphrium*) in the Copenhagen herbarium, but its citation in the form *E. submoniliforme* (Engl.) L. Marchand ex Rose, would be somewhat misleading.—A.A.B.

Contr. U.S. Nat. Herb. **5**, 114 (1897). *Terebinthus submoniliformis* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium submoniliforme* (Engl.) Rose in N. Amer. Fl. **25**, 255 (1911); L. Marchand ex Engl. in DC. Monogr. **4**, 55 (1883), in syn.; Standl. in Contr. U.S. Nat. Herb. **23**, 551 (1923).

This species is known only from very young and imperfect material. It is probably allied to *B. velutina* (q.v.).

STATE OF OAXACA: Rio Vuellas, Liebmann (C, P, B; type collection).

**Bursera subtrifoliata** (Rose) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Terebinthus subtrifoliata* Rose in Contr. U.S. Nat. Herb. **10**, 122 (1906). *Elaphrium subtrifoliata* (Rose) Rose in N. Amer. Fl. **25**, 244 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 545 (1923).

As stated elsewhere, this is a close ally of *B. trimera*, but not, as suggested by Rose, of *B. Hindsiana*.

STATE OF JALISCO: West of Bolaños, Sept. 1897 (fr.), Rose 3014 (U; type).

**Bursera Tecomaca** (DC.) Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929). *Amyris Tecomaca* DC. in DC. Prodr. **2**, 82 (1825); Alph. DC. Calq. Dess. t. 195 (1875); Engl. in DC. Monogr. **4**, 59 (1883), sub spp. dub.; Rose in N. Amer. Fl. **25**, 257 (1911), sub spp. dub. *Elaphrium tecomaca* (DC.) Standl. in Contr. U.S. Nat. Herb. **23**, 550 (1923), quoad syn. typ.—*Bursera Kerberi* Engl. in DC. Monogr. **4**, 41 (1883), et in Engl. et Prantl, Nat. Pflanzenfam. **3**, **4**, 249 (1896); S. Wats. in Proc. Amer. Acad. **22**, 402 (1887); Urbina, Cat. Pl. Mex. **39** (1897). *Terebinthus Kerberi* (Engl.) Rose in Contr. U.S. Nat. Herb. **10**, 119 (1906). *Elaphrium Kerberi* (Engl.) Rose in N. Amer. Fl. **25**, 247 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 546 (1923).—*Amyris sylvatica* Sessé et Moc. Fl. Mex. ed. **2**, 93 (1894), non Jacq. (1763).

The inclusion by Standley of *Bursera fragilis* S. Wats. (see *B. lancifolia*, p. 369) as a synonym of his *Elaphrium tecomaca* (1923) suggests that, although citing only *Amyris Tecomaca* DC. as a synonym of his *Bursera Tecomaca* (1929), he was actually including under the combination specimens of Watson's species. I am unable to agree with Standley's identification of Sessé and Mociño's plant with the northern *B. fragilis*, and consider that, allowing for the pooriness of the figure, *B. Kerberi* fits it very well. Rose's suggestion that it is "near *E. graveolens* and *E. pilosum*", is misleading.

*Bursera Tecomaca* may be one of the species used for the production of Linaloe Oil; it is very resinous and may also be a source of Mexican Elemi.

Dr. Palmer's specimen carries the information, "A tree with few branches, about 16 ft. high and a foot in diameter, covered with loose bronzy papyraceous bark", whilst Mr. Hinton's labels state that it is a sweetly aromatic shrub or tree, 2–10 m. in height, bearing the general vernacular names "Copal" and "Copal Santo."



The specimens cited give a less discontinuous distribution than that given by Standley for *Elaphrium tecomaca*, and also indicate adjacent areas where the tree may be found.

STATE OF MEXICO : District of Temascaltepec ; Volcán, 1450 m., June 1932 (fl.), *Hinton* 738 ; Acatitlán, June 1934 (young fr.), *Hinton* 6192 ; Ixtapan, Dec. 1934 (fr.), *Hinton* 7158 ; Cañitas, Jan. 1935 (fr.), *Hinton* 7295 ; Cañitas—Salitre, Jan. 1935 (fr.), *Hinton* 7300 ; Cañitas, May 1935 (fl.), *Hinton* 7775 ; Vigas, May 1935 (fl.), *Hinton* 7815 ; Ixtapan, May 1935 (fl.), *Hinton* 7819.

STATE OF JALISCO : Tequila, Aug.—Sept. 1886 (fr.), *Palmer* 423 ; Tequila, Oct. 1893 (fr.), *Pringle* 4531 (K, B).

STATE OF COLIMA : Without exact locality or date (fr.), *Kerber* 310 (B ; type of *B. Kerberi*).

STATE OF GUERRERO : Mountains near Mazatlán, *Sessé and Mociño* (type, not seen).

***Bursera trifoliolata* Bullock**, sp. nov. ; ramis ramosissimis, foliis dense pubescentibus trifoliolatis, seminibus acute trigonis distincta ; a *B. Hindsiana* (Benth.) Engl. foliis minoribus semper trifoliolatis marginibus minus dentatis, inflorescentiis brevius pedunculatis (saepe floribus fasciculatis) magis floriferis facile distinguenda.

*Frutex* 1–4 m. altus, vel *arbor* parva usque ad 6 m. alta, ramosissima, cortice pubescente (demum glabrato) rubro vel rubro-griseo, ramulis ultimis subspiniformibus 2–4 mm. diametro ; ramuli floriferi valde abbreviati ; ramuli steriles elongati, dense piloso-pubescentes, internodiis 1–2.5 cm. longis. *Folia* semper trifoliolata, apice ramulorum floriferorum congesta, vel secus ramulos steriles alterna ; petioli usque ad 2 cm. longi sed saepe multo breviores, dense piloso-pubescentes ; foliolum terminale obovatum vel rhomboideum vel oblanceolato-obovatum, usque ad 3.5 cm. longum et 1.5 cm. latum, apice rotundatum usque subacutum, basi cuneatum ; foliola lateralia minora, elliptica usque suborbicularia, utrinque plus minusve rotundata ; foliola omnia marginibus integra vel apicem versus plus minusve crenata, nervis lateralibus venulisque haud prominentibus, utraque pagina satis dense pilosa. *Flores* pauci vel numerosi, ex axillis foliorum juniorum fasciculati, vel in cymas paucifloras ebracteatas dispositi ; pedicelli 2–3 mm. longi, dense pubescentes. *Sepala* 3, ovata, circiter 1.5 mm. longa, interdum inaequalia, apice obtusa vel subacuta, extra dense pubescentia. *Petala* 3, oblonga, 5 mm. longa, apice obtusiuscula, leviter cucullata, sub anthesi marginibus valde incurva, extra leviter pilosa. *Stamina* 4–6, filamentis subulatis vix 2 mm. longis, antheris lineari-oblongis 1.5 mm. longis sed interdum minoribus et nonnunquam valde reductis et sterilibus. *Ovarium* non visum. *Discus* cupulari-annularis, satis profunde 4–6-crenatus. *Drupae* ambitu ovoideae apice acutae, acute trigonae, 7–8 mm. longae et circiter 6 mm. latae, pedicellis plus minusve abrupte reflexis, valvis 3 prius quam

378

seminibus delabentibus. *Semina* acute trigona, ambitu ovata, 5 mm. longa et 4.5 mm. lata, apice acuta, arillo flavido vel aurantiaco omnino induta.

STATE OF MEXICO : District of Temascaltepec ; Bejucos, 610 m., " a tree by the river ", June 1932 (fl.), *Hinton* 780 ; *ibid.* " shrub 4 m.", June 1935 (fl.), *Hinton* 7841 ; *ibid.* " from same tree as No. 7841 ", Oct. 1935 (fr.), *Hinton* 8529 ; Guayabal, 790 m., May 1933 (fl.), *Hinton* 3943 ; Calera, " tree 6 m. with milky sap ; poisonous ", July 1934, (fr.), *Hinton* 6340 (type) ; Limones, " shrub 1.5 m. ; sap milky, poisonous ", Jan. 1935 (fr.), *Hinton* 7238 ; Luvianos, " shrub 2.5 m., poisonous ", May 1935 (fl.), *Hinton* 7781.

STATE OF GUERRERO : District of Coyuca ; Pochote, " shrub 1.5 m.", June 1935 (fl.), *Hinton* 7879.

*Vernacular names* : Quincanchire(i) ; Copal.

A feature of this species is the constancy of the trifoliation of the leaves ; in some other species where trifoliate leaves occur, great variation in the number of leaflets occurs, as in *B. Hindsiana*, (q.v.) in which variation from 1-9 leaflets is recorded by Brandegee.

I have been unable to find a close affinity for *B. trifoliolata*, though in general appearance it recalls *B. Hindsiana* most strongly.

***Bursera trimera* Bullock, sp. nov. ; *B. subtrifoliatae* Rose** affinis sed foliis oblongis vel obovato-oblanceolatis longioribus, marginibus fere ad basin profundius serrato-crenatis, nervis lateralibus parallelis manifestis numerosioribus, petiolis plerumque longioribus satis distincta.

*Frutex* vel *arbor* parva, 1.5-6 m. alta, glaberrima ; truncus cortice papyraceo exfoliato indutus ; rami ramulique pro rata graciles, 2-5 mm. diametro, striati, laterales abbreviati. *Folia* digitatim trifoliolata val rarius unifoliolata, apice ramulorum abbreviatorum congesta vel secus ramulos steriles alterna ; foliola terminalia subsessilia vel brevissime petiolulata, oblonga vel saepius obovato-oblanceolata, usque ad 3 cm. longa et 1.5 cm. lata (plerumque minora), apice semper rotundata, basi cuneata, marginibus serrato-crenatis, nervis lateralibus parallelis approximatis utrinsecus 10-14 cum costa manifestis ; foliola lateralia subsessilia, similia, sed plerumque paullo minora et saepe basin versus inaequilateralia hic etiam margine superiore integra ; petioli circiter 1 cm. longi. *Flores* masculi tantum visi, trimeri, ex axillis foliorum apice ramulorum solitarii vel 2-3 orti, saepe prius quam folia producta ; pedicelli obsoleti vel brevissimi vel usque ad 1 mm. longi. *Calyx* 3-partitus, sepalis late patentibus ovato-triangularibus obtusis vel subacutis vix 1 mm. longis. *Petala* latissime elliptica, apice rotundata, fere 2.5 mm. longa, 2 mm. lata, marginibus incurvis, rigida, adscendentia et paullo divergentia. *Stamina* 6, filamentis filiformibus vix 1 mm. longis, antheris oblongo-ellipsoideis 1 mm. longis vel paullo longioribus. *Discus* carnosus, 3-crenatus, plano-concavus. *Drupae* trigonae, ambitu oblique ovatae, apice subacutae, demum 3-valvatae. *Semina* solitaria, trigona, arillo pallido omnino induta.

STATE OF MEXICO : District of Temascaltepec ; Calera, May 1935 (fl.), *Hinton 7743*.

STATE OF MICHOACAN : District of Huetamo ; Mal Paso, May 1935 (fl.), *Hinton 7765*.

STATE OF GUERRERO : District of Coyuca ; Santa Bárbara, June 1935 (fl.), *Hinton 7590* ; Pungarabato, April 1934 (fl.), *Hinton 5943, 5997* ; *ibid.* July 1934 (fr.), *Hinton 6262* (type) ; *ibid.* June 1934 (fr.), *Hinton 6934* ; *ibid.* Jan. 1935, *Hinton 7245* ; *ibid.* May 1935 (fl.), *Hinton 7759* ; *ibid.* June 1935 (fl., fr.), *Hinton 7848*.

*Vernacular name* : Copal.

*Bursera trimera* normally has trifoliolate leaves, but unifoliolate ones occur, usually on vigorous long vegetative shoots, and much more rarely on the short lateral fruiting branches. Flowers are normally produced before the leaves, in April and May, but one specimen (*Hinton 7848*), collected in June, shows flowers, fruit, and almost fully grown leaves. The type specimen (*Hinton 6262*), collected in July, shows mature leaves and almost mature fruit, whilst another (*Hinton 6934*), collected in November, shows leaves in the "sere and yellow" stage, and ripe dehiscent drupes. One other specimen (*Hinton 7743*) collected in May, shows comparatively young leaves and old flowers. With one exception, the remainder are flowering and leafless, the January specimen (*Hinton 7272*) having old fruits, either dehiscent or for some reason still quite firmly closed.

The nearest ally of *Bursera trimera* is undoubtedly *B. subtrifoliata* (Rose) Standl., though the latter is not by any means a close relative of *B. Hindsiana* Benth, as was suggested by Rose when publishing the original description (in Contr. U.S. Nat. Herb. 10, 122 : 1906, under *Terebinthus*), since Bentham's species has tetramerous flowers and a paniculate inflorescence, in addition to a copious indumentum on leaves, young stems and inflorescence.

***Bursera velutina* Bullock, sp. nov.**, foliis supra glauco-velutinis, infra albido-tomentosis, foliolis multijugatis distincta ; a *B. submoniliformi* Engl. petiolis brevioribus, foliolis numerosioribus grossius dentatis, alis interstitialibus distinctis, sepalis brevioribus facile distinguenda.

*Frutex* vel *arbor*, 2-6 m. alta ; rami annotini teretes, crassi, circiter 1 cm. diametro, glabri, cortice laevi brunneo-rubro vel demum griseo ; rami hornotini dense minute puberuli. *Folia* imparipinnata, ambitu oblongo-oblancoolata, circiter 10 cm. longa, 3-4 cm. lata, petiolis usque ad 1 cm. longis sed saepissime brevioribus, interstitiis inter juga crenato-alatis usque ad 2.5 mm. latis, supra glauco-pubescentia, infra tomentosa albicantia ; foliola 9-12-jugata, oblonga, usque ad 2 cm. longa et 7 mm. lata, marginibus satis grosse et obtuse serrata, apice subacuta vel rotundata, basi rotundata, brevissime petiolulata vel sessilia, supra velutino-tomentella et satis rugoso-reticulata, infra breviter albido-tomentosa et nervis venulisque prominentibus reticulata,

nervis lateralibus utrinsecus 8-10. *Flores* prius quam folia apparentes, in thyrsos angustos 2-3 cm. longos dense albido-pilosos dispositi; pedicelli graciles, usque ad 3-5 mm. longi, infra florem articulati; bracteae parvae, lineari-subulatae, deciduae. *Sepala* 4, oblongo-ovata, apice obtusa, 1-5 mm. longa, 1 mm. lata, extra pilosa. *Petala* 4, obovato-oblonga, apice obtusa, 3-5 mm. longa, 1-5 mm. lata, extra pilosa. *Stamina* (floris masculi) 8, filamentis filiformibus 1-25 mm. longis, antheris oblongis 1 mm. longis; stamina (floris feminei) abortiva, minora. *Ovarium* (floris feminei) globosum, 1-25 mm. diametro, glabrum; stylus crassus, conicus, 1 mm. longus; stigma capitatum, leviter 3-lobum. *Discus* carnosus, annularis, leviter crenatus. *Drupae* globosae, circiter 7 mm. diametro, apice brevissime apiculatae, leviter rugosae, brunneae, glabrae, demum valvis 2 dehiscentes. *Semina* globosa, luteo-alba, 6 mm. diametro.

STATE OF GUERRERO: District of Coyuca; Querendas, "tree 4 m., flower white", April 1934 (fl.), *Hinton* 5960; *ibid.* "6 m." May 1935 (fl.), *Hinton* 7760; Pungarabato, "shrub 3 m.", June 1934 (young fr.), *Hinton* 6124; *ibid.* "tree 4 m.; sweet smelling", July 1934 (fr.), *Hinton* 6261 (type); *ibid.* "2 m. high", Oct. 1934 (fr.), *Hinton* 6894; *ibid.* "2 m. high", May 1935 (young fr.), *Hinton* 7751; Cuajuilote, "shrub 2 m." May 1935 (fl.), *Hinton* 7747.

This is a very distinct species, characterised by the very short velvety indumentum on the upper surface of the leaves, which gives them a glaucous appearance, and the white tomentum of the lower surface. The short slender inflorescences, which appear before the leaves are also characteristic.

The relationship of *B. submoniliformis* to *B. velutina* is not clear, but of all the species I have seen it approaches nearest in general appearance to the plant described here. It is known to me only from the type collection (*Liebmann* 76, in the Copenhagen herbarium, from Oaxaca) and the material is in a very young condition, with imperfectly developed leaves and inflorescences. Engler's description (in DC. Monogr. 4, 55: 1883) states "foliis . . . 6-jugis", but the type specimen shows no leaves with more than eleven leaflets, and most of them have only seven leaflets. Standley (in Contr. U.S. Nat. Herb. 23, 551: 1923), gives some indication that he has seen other specimen(s), also from Oaxaca, in which the leaflets attain 3 cm. in length, as against Engler's maximum measurement of 1 cm. shown by the type specimen.

#### DOUBTFUL SPECIES AND SPECIES NOT SEEN.

***Elaphrium subpubescens*** Rose in N. Amer. Fl. 25, 247 (1911). *Bursera gummifera* var. *pubescens* Engl. in DC. Monogr. 4, 40 (1883), non *Elaphrium pubescens* Schlecht. (1842).

This was founded on two specimens collected by Bourgeau (Nos. 2899 and 3131) in Vera Cruz, and preserved in the Paris Herbarium. Standley has included them in his *Elaphrium Simaruba*, and although it is doubtful whether they really belong to that West Indian species, it is impossible to say what their status is.

**Terebinthus attenuata** Rose in Contr. U.S. Nat. Herb. **12**, 278 (1909). *Elaphrium attenuatum* (Rose) Rose in N. Amer. Fl. **25**, 247 (1911).

Founded on a plant from Sinaloa, this also is included under *Elaphrium Simaruba* by Standley. The type material is inadequate for diagnostic purposes.

**Terebinthus pilosa** (Engl.) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909). *Bursera graveolens* var. *pilosa* Engl. in DC. Monogr. **4**, 49 (1883). *Elaphrium pilosum* (Engl.) Rose in N. Amer. Fl. **25**, 251 (1911).—*Elaphrium penicillatum* Standl. in Contr. U.S. Nat. Herb. **23**, 549 (1923) partim, non DC. (1824).

This was founded on a Kerber specimen from Colima, and I have been unable to separate it and some few other specimens from the South American *B. graveolens* Triana et Planch., with which Engler associated it. All the specimens seen, however, are too incomplete to provide the necessary diagnostic characters. It may be taken as certain that it is not equal to *B. penicillata* (DC.) Engl. as delimited by the present writer on p. 374.

**Elaphrium ariense** H.B.K. Nov. Gen. et Sp. **7**, 31 (1825).

Engler describes the type of this as "Specimen valde incompletum in herb. Mus. Paris." All authors since Kunth have regarded it as a doubtful species.

**Elaphrium pubescens** Schlecht. in Linnaea, **16**, 527 (1842); Rose in N. Amer. Fl. **25**, 251 (1911); Standl. in Contr. U.S. Nat. Herb. **25**, 550 (1923). *Terebinthus pubescens* (Schlecht.) Rose in Contr. U.S. Nat. Herb. **12**, 279 (1909).

Engler overlooked this plant; it seems likely that Standley's suggestion that it is introduced into Mexico is correct. It may be a form of *B. graveolens* Triana et Planch.

#### EXCLUDED SPECIES.

*Bursera pubescens* S. Wats. in Proc. Amer. Acad. **24**, 44 (1889), non *Elaphrium pubescens* Schlecht. (1842).—*Pachycormus discolor* (Benth.) Coville, Cent. Dict. rev. ed. 6708 (1911); Standl. in Contr. U.S. Nat. Herb. **23**, 671 (1923), cum syn. = *VEATCHIA DISCOLOR* (Benth.) T. S. Brandeg. var. *PUBESCENS* (S. Wats.) I. M. Johnst. in Proc. Calif. Acad. Sc. IV. **12**, 1079 (1924); Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. **4**, 217 (1929).

According to Johnston, who collected it at the type locality, Los Angeles Bay, and on Angel de la Guarda Island, this plant "is the most widely distributed of the varieties of *V. discolor* and is probably the best known." Watson described it as a species of *Bursera* from sterile material. The genus belongs to the Anacardiaceae, and the species was first described as *Schinus discolor* by Bentham in 1844.

*Rhus Veatchiana* Kellogg in Proc. Calif. Acad. 2, 24 (1863) ; Engl. in DC. Monogr. 4, (1883) sub sp. dub. *Burserae*.—*Pachycormus discolor* (Benth.) Coville, Cent. Dict. rev. ed. 6708 (1911) ; Standl. in Contr. U.S. Nat. Herb. 23, 671 (1923), cum syn.

This plant, listed as a doubtful species of *Bursera* by Engler, is *VEATCHIA DISCOLOR* (Benth.) T. S. Brandeg. var. *VEATCHIANA* (Kellogg) I. M. Johnst. in Proc. Calif. Acad. Sc. IV. 12, 1081 (1924), cum obs.

#### INDEX TO SPECIES AND SYNONYMS.

<i>Amyris bicolor</i> Willd. ex Schlecht = <i>B. bicolor</i>	<b><i>Bursera biflora</i></b> (Rose) Standl., p. 354
„ <i>bipinnata</i> Sessé et Moc. ex DC. = <i>B. bipinnata</i>	„ <b><i>bipinnata</i></b> (Sessé et Moc. ex DC.) Engl., p. 355
„ <i>copallifera</i> (Sessé et Moc. ex DC.) Spreng. = <i>B. copalli- fera</i>	„ <b><i>cerasifolia</i></b> T. S. Brandeg., p. 356
„ <i>crenata</i> Willd. ex Schlecht. = <i>B. fagaroides</i>	„ <i>cinerea</i> Engl. = <i>B. grandifolia</i>
„ <i>fagaroides</i> (H.B.K.) Spreng. = <i>B. fagaroides</i>	„ <b><i>collina</i></b> T. S. Brandeg., p. 356
„ <i>gorullensis</i> (H.B.K.) Spreng. = <i>B. gorullensis</i>	„ <i>concinna</i> Sandw. = <i>B. laxi- flora</i>
„ <i>lanuginosa</i> (H.B.K.) Spreng. = <i>B. gorullensis</i>	„ <b><i>confusa</i></b> (Rose) Bullock, p. 356
„ <i>Linaloe</i> La Ll. = <i>B. glabri- folia</i>	„ <b><i>copallifera</i></b> (Sessé et Moc. ex DC.) Bullock, p. 357
„ <i>Linanoe</i> La Ll. = <i>B. glabri- folia</i>	„ <b><i>coyucensis</i></b> Bullock, p. 358
„ <i>penicillata</i> (Sessé et Moc. ex DC.) Spreng. = <i>B. penicil- lata</i>	„ <i>cuneata</i> (Schlecht.) Engl. = <i>B. gorullensis</i>
„ <i>rugosa</i> Willd. ex Schlecht. = <i>B. gorullensis</i>	„ <i>Delpechiana</i> Poiss. ex Engl. = <i>B. penicillata</i>
„ <i>sylvatica</i> Sessé et Moc. = <i>B. Tecomaca</i>	„ <b><i>diversifolia</i></b> Rose, p. 359
„ <i>Tecomaca</i> DC. = <i>B. Tecomaca</i>	„ <b><i>elemifera</i></b> (Royle) Baill., p. 359
„ <i>ventricosa</i> La Ll. ex Schlecht = <i>B. fagaroides</i>	„ <b><i>excelsa</i></b> (H.B.K.) Engl., p. 360
<i>Balsamodendrum Liebmannii</i> L. Mar- chand MS. = <i>B. grandifolia</i>	„ <b><i>fagaroides</i></b> (H.B.K.) Engl., p. 361
<b><i>Bursera acutidens</i></b> Sprague et Riley = <i>B. excelsa</i>	„ <b><i>filicifolia</i></b> T. S. Brandeg., p. 363
„ <i>Aloexylon</i> (Schiede ex Schlecht.) Engl. = <i>B. glabrifolia</i>	„ <i>fragilis</i> S. Wats. = <i>B. lanci- folia</i>
„ <i>aptera</i> Ramirez = <i>B. faga- roides</i>	„ <b><i>Galeottiana</i></b> Engl., p. 363
„ <b><i>arborea</i></b> (Rose) Bullock, p. 353	„ <i>glabrescens</i> (S. Wats.) Rose = <i>B. gorullensis</i>
„ <b><i>arida</i></b> (Rose) Standl., p. 353	„ <b><i>glabrifolia</i></b> (H.B.K.) Engl., p. 363
„ <b><i>asplenifolia</i></b> T. S. Brandeg. p. 353	„ <i>gracilis</i> Engl. = <i>B. bipinnata</i>
„ <b><i>bicolor</i></b> (Willd. ex Schlecht.) Engl., p. 354	„ <b><i>grandifolia</i></b> (Schlecht.) Engl., p. 364
	„ <i>graveolens</i> var. <i>pilosa</i> Engl. ; sp. dub., p. 382
	„ <i>gummifera</i> var. <i>pubescens</i> Engl. ; sp. dub., p. 381
	„ <b><i>heterophylla</i></b> Engl., p. 365
	„ <b><i>Hindsiana</i></b> (Benth.) Engl., p. 366

**Bursera Hintoni** Bullock, p. 366  
 „ *Jonesii* Rose = B. Schlechtendalii  
 „ *zorullensis* (H.B.K.) Engl., p. 368  
 „ *Karwinskii* (Engl.) Rose, p. 369  
 „ *Kerberi* Engl. = B. Tecomaca  
 „ *lancifolia* (Schlecht.) Engl., p. 369  
 „ *lanuginosa* (H.B.K.) Engl. = B. zorullensis  
 „ *laxiflora* S. Wats., p. 370  
 „ *lonchophylla* Sprague et Riley = B. confusa  
 „ *longipedunculata* (Rose) Standl., p. 371  
 „ *longipes* (Rose) Standl., p. 371  
 „ *mexicana* Engl. p.p. = B. elemifera  
 „ *mexicana* Engl. p.p. = B. penicillata  
 „ *microphylla* A. Gray, p. 371  
 „ *morelensis* Ramirez = B. microphylla  
 „ *multijuga* Engl., p. 372  
 „ *Nelsoni* Rose = B. glabrifolia  
 „ *nesopola* I. M. Johnst. = B. Hindsiana  
 „ *obovata* Turcz. = B. fagaroides  
 „ *occidentalis* (Rose) Riley = B. grandifolia  
 „ *odorata* T. S. Brandeg. = B. fagaroides  
 „ *ovalifolia* (Schlecht.) Engl., p. 373  
 „ *Palmeri* S. Wats. = B. excelsa  
 „ *pannosa* L. Marchand ex Engl. = B. sessiliflora  
 „ *penicillata* (Sessé et Moc. ex DC.) Engl., p. 374  
 „ *Pringlei* S. Wats. = B. multijuga  
 „ *pubescens* S. Wats. = Veatchia discolor var. pubescens  
 „ *Purpusii* T. S. Brandeg. = B. fagaroides  
 „ *quevelarensis* (Rose) Standl. = B. excelsa  
 „ *rhotifolia* (Benth.) I.M. Johnst. = B. Hindsiana  
 „ *rubra* (Rose) Riley, p. 375  
 „ *Schaffneri* S. Wats. = B. fagaroides  
 „ *Schiedeana* Engl. = B. glabrifolia  
 „ *Schlechtendalii* Engl., p. 375  
 „ *sessiliflora* Engl., p. 375

**Bursera sphaerocarpa** Sprague et Riley = B. excelsa  
 „ *stenophylla* Sprague et Riley, p. 376  
 „ *submoniliformis* Engl., p. 376  
 „ *subtrifoliata* (Rose) Standl., p. 377  
 „ *Tecomaca* (DC.) Standl., p. 377  
 „ *tenuifolia* Engl. ex O.Kuntze = B. elemifera  
 „ *tenuifolia* Rose = B. confusa  
 „ *trifoliolata* Bullock, p. 378  
 „ *trijuga* Ramirez = B. lancifolia  
 „ *trimeria* Bullock, p. 379  
 „ *velutina* Bullock, p. 380

**Elaphrium acuminatum** (Rose) Rose = B. ovalifolia  
 „ *Aloëxylon* Schiede ex Schlecht = B. glabrifolia  
 „ *apterum* (Ramirez) Rose = B. fagaroides  
 „ *arboreum* (Rose) Rose = B. arborea  
 „ *aridum* (Rose) Rose = B. arida  
 „ *ariense* H.B.K.; sp. dub., p. 382  
 „ *aspleniifolium* (T. S. Brandeg.) Rose = B. aspleniifolia  
 „ *attenuatum* (Rose) Rose; sp. dub., p. 382  
 „ *bicolor* Willd. ex Schlecht. = B. bicolor  
 „ *biflorum* (Rose) Rose = B. biflora  
 „ *bipinnatum* (Sessé et Moc. ex DC.) Schlecht. = B. bipinnata  
 „ *brachypodium* Rose = B. sessiliflora  
 „ *cerasifolium* (T. S. Brandeg.) Rose = B. cerasifolia  
 „ *cinereum* (Engl.) Rose = B. grandifolia  
 „ *collinum* (T. S. Brandeg.) Rose = B. collina  
 „ *confusum* Rose = B. confusa  
 „ *copalliferum* (Sessé et Moc. ex DC.) = B. copallifera  
 „ *Covillei* Rose = B. fagaroides  
 „ *cuneatum* Schlecht. = B. zorullensis

<i>Elaphrium Delpechianum</i> (Poiss. ex Engl.) Rose = B. penicillata	<i>Elaphrium multifolium</i> (Rose) Rose = B. microphylla
„ <i>diversifolium</i> (Rose) Rose = B. diversifolia	„ <i>multijugum</i> (Engl.) Rose = B. multijuga
„ <i>elemiferum</i> Royle = B. elemifera	„ <i>Nelsoni</i> (Rose) Rose = B. glabrifolia
„ <i>epinnatum</i> Rose = B. Hindsiana	„ <i>obovatum</i> (Turcz.) Rose = B. fagaroides
„ <i>excelsum</i> H.B.K. = B. excelsa	„ <i>occidentale</i> Rose = B. grandifolia
„ <i>fagaroides</i> H.B.K. = B. fagaroides	„ <i>odoratum</i> (T. S. Brandeg.) Rose = B. fagaroides
„ <i>filicifolium</i> (T. S. Brandeg.) Rose = B. filicifolia	„ <i>odoratum</i> Standl. p.p. = B. confusa
„ <i>fragile</i> (S. Wats.) Rose = B. lancifolia	„ <i>odoratum</i> Standl. p.p. = B. fagaroides
„ <i>Galeottianum</i> (Engl.) Rose = B. Galeottiana	„ <i>odoratum</i> Standl. p.p. = B. sessiliflora
„ <i>glabrescens</i> (S. Wats.) Rose = B. jorullensis	„ <i>ovalifolium</i> Schlecht. = B. ovalifolia
„ <i>glabrifolium</i> Schlecht. = B. glabrifolia	„ <i>Palmeri</i> (S. Wats.) Rose = B. excelsa
„ <i>Goldmani</i> Rose = B. Hindsiana	„ <i>pannosum</i> (L. Marchand ex Engl.) Rose = B. sessiliflora
„ <i>gracile</i> (Engl.) Rose = B. bipinnata	„ <i>penicillatum</i> Sessé et Moc. ex DC. = B. penicillata
„ <i>grandifolium</i> Schlecht. = B. grandifolia	„ <i>pilosum</i> (Engl.) Rose ; sp. dub , p. 382
„ <i>heterophyllum</i> (Engl.) Rose = B. heterophylla	„ <i>Pringlei</i> (S. Wats.) Rose = B. multijuga
„ <i>Hindsianum</i> Benth. = B. Hindsiana	„ <i>pubescens</i> Schlecht. ; sp. dub., p. 382
„ <i>Jonesii</i> (Rose) Rose = B. Schlechtendalii	„ <i>Purpusii</i> (T. S. Brandeg.) Rose = B. fagaroides
„ <i>jorullense</i> H.B.K. = B. jorullensis	„ <i>queretarensis</i> Rose = B. excelsa
„ <i>Karwinskii</i> (Engl.) Rose = B. Karwinskii	„ <i>rhoifolium</i> Benth. = B. Hindsiana
„ <i>Kerberi</i> (Engl.) Rose = B. Tecomaca	„ <i>rubrum</i> (Rose) Rose = B. rubra
„ <i>lancifolium</i> Schlecht. = B. lancifolia	„ <i>Schaffneri</i> (S. Wats.) Rose = B. fagaroides
„ <i>lanuginosum</i> H.B.K. = B. jorullensis	„ <i>Schiedeanum</i> (Engl.) Rose = B. glabrifolia
„ <i>laxiflorum</i> (S. Wats.) Rose = B. laxiflora	„ <i>sessiliflorum</i> (Engl.) Rose = B. sessiliflora
„ <i>longipedunculatum</i> Rose = B. longipedunculata	„ <i>sessiliflorum</i> Standl. p.p. = B. aspleniifolia
„ <i>longipes</i> (Rose) Rose = B. longipes	„ <i>Simaruba</i> Standl. p.p. = B. arborea
„ <i>MacDougalii</i> (Rose) Rose = B. Hindsiana	„ <i>Simaruba</i> Standl. p.p. = B. ovalifolia
„ <i>mexicanum</i> (Engl.) Rose = B. penicillata	„ <i>simplicifolium</i> Schlecht. = B. Schlechtendalii
„ <i>microphyllum</i> (A. Gray) Rose = B. microphylla	„ <i>submoniliforme</i> (Engl.) Rose = B. submoniliformis
„ <i>morelense</i> (Ramirez) Rose = B. microphylla	„ <i>subpubescens</i> Rose ; sp. dub., p. 381



<i>Elaphrium subtrifoliata</i> (Rose) Rose	<i>Terebinthus heterophylla</i> (Engl.) Rose
= <i>B. subtrifoliata</i>	= <i>B. heterophylla</i>
„ <i>Tecomaca</i> (DC.) Standl.	„ <i>Jonesii</i> (Rose) Rose = <i>B.</i>
= <i>B. Tecomaca</i>	<i>Schlechtendalii</i>
„ <i>Tecomaca</i> Standl. p.p. = <i>B.</i>	„ <i>zorullensis</i> (H.B.K.) W.F.
<i>lancifolia</i>	Wight ex Rose = <i>B.</i>
„ <i>tenuifolium</i> (Rose) Rose	<i>zorullensis</i>
= <i>B. confusa</i>	„ <i>Karwinskii</i> (Engl.) Rose
„ <i>trijugum</i> (Ramirez) Rose	= <i>B. Karwinskii</i>
= <i>B. lancifolia</i>	„ <i>Kerberi</i> (Engl.) Rose = <i>B.</i>
<i>Rhus filicina</i> Sessé et Moc. ex	<i>Tecomaca</i>
DC. = <i>B. bipinnata</i>	„ <i>lancifolia</i> (Schlecht.) W.F.
„ <i>Veatchiana</i> Kellogg =	Wight ex Rose = <i>B.</i>
<i>Veatchia discolor</i> var.	<i>lancifolia</i>
<i>Veatchiana</i>	„ <i>lanuginosa</i> (H.B.K.) Rose
<i>Terebinthus acuminata</i> Rose = <i>B. ovali-</i>	= <i>B. zorullensis</i>
<i>folia</i>	„ <i>laxiflora</i> (S. Wats.) Rose
„ <i>Aloëxylon</i> (Schiede ex	= <i>B. laxiflora</i>
Schlecht.) W.F. Wight	„ <i>longipes</i> Rose = <i>B. longipes</i>
ex Rose = <i>B. glabrifolia</i>	„ <i>MacDougalii</i> Rose = <i>B.</i>
„ <i>aptera</i> (Ramirez) Rose =	<i>Hindsiana</i>
<i>B. fagaroides</i>	„ <i>mexicana</i> (Engl.) W. F.
„ <i>arborea</i> Rose = <i>B. arborea</i>	Wight ex Rose = <i>B.</i>
„ <i>arida</i> Rose = <i>B. arida</i>	<i>penicillata</i>
„ <i>attenuata</i> Rose; sp. dub.,	„ <i>microphylla</i> (A. Gray) Rose
p. 382.	= <i>B. microphylla</i>
„ <i>bicolor</i> (Willd. ex Schlecht.)	„ <i>morelensis</i> (Ramirez) Rose
Rose = <i>Bursera bicolor</i>	= <i>B. microphylla</i>
„ <i>biflora</i> Rose = <i>B. biflora</i>	„ <i>multifolia</i> Rose = <i>B. micro-</i>
„ <i>bipinnata</i> (Sessé et Moc.	<i>phylla</i>
ex DC.) W.F. Wight ex	„ <i>multijuga</i> (Engl.) Rose =
Rose = <i>B. bipinnata</i>	<i>B. multijuga</i>
„ <i>cerasifolia</i> (T. S. Brandeg.)	„ <i>Nelsoni</i> (Rose) Rose = <i>B.</i>
Rose = <i>B. cerasifolia</i>	<i>glabrifolia</i>
„ <i>cinerea</i> (Engl.) Rose = <i>B.</i>	„ <i>odorata</i> (T. S. Brandeg.)
<i>grandifolia</i>	Rose = <i>B. fagaroides</i>
„ <i>cuneata</i> (Schlecht.) Rose	„ <i>ovalifolia</i> (Schlecht.) Rose
= <i>B. zorullensis</i>	= <i>B. ovalifolia</i>
„ <i>Delpechiana</i> (Poiss. ex	„ <i>Palmeri</i> (S. Wats.) Rose =
Engl.) Rose = <i>B. penicil-</i>	<i>B. excelsa</i>
<i>lata</i>	„ <i>pannosa</i> (L. Marchand ex
„ <i>diversifolia</i> (Rose) Rose	Engl.) Rose = <i>B. sessili-</i>
= <i>B. diversifolia</i>	<i>flora</i>
„ <i>excelsa</i> (H.B.K.) W.F.	„ <i>penicillata</i> (Sessé et Moc.
Wight ex Rose = <i>B. ex-</i>	ex DC.) Rose = <i>B. peni-</i>
<i>celsa</i>	<i>cillata</i>
„ <i>fagaroides</i> (H.B.K.) Rose	„ <i>pilosa</i> Rose; sp. dub.,
= <i>B. fagaroides</i>	p. 382.
„ <i>fragilis</i> (S. Wats.) Rose	„ <i>Pringlei</i> (S. Wats.) Rose
= <i>B. lancifolia</i>	= <i>B. multijuga</i>
„ <i>Galeottiana</i> (Engl.) Rose	„ <i>pubescens</i> (Engl.) Rose;
= <i>B. Galeottiana</i>	sp. dub., p. 382
„ <i>glabrescens</i> (S. Wats.) Rose	„ <i>rhoifolia</i> (Benth.) Rose
= <i>B. zorullensis</i>	= <i>B. Hindsiana</i>
„ <i>gracilis</i> (Engl.) Rose = <i>B.</i>	„ <i>rubra</i> Rose = <i>B. rubra</i>
<i>bipinnata</i>	„ <i>Schaffneri</i> (S. Wats.) Rose
„ <i>grandifolia</i> (Schlecht.)	= <i>B. fagaroides</i>
Rose = <i>B. grandifolia</i>	„ <i>Schiedeana</i> (Engl.) Rose
	= <i>B. glabrifolia</i>

<i>Terebinthus Schlechtendalii</i> (Engl.)	<i>Terebinthus trijuga</i> (Ramirez) Rose=
Rose = <i>B. simplicifolia</i>	<i>B. lancifolia</i>
„ <i>sessiliflora</i> (Engl.) Rose =	
<i>B. sessiliflora</i>	
„ <i>submoniliformis</i> (Engl.)	<i>Veatchia discolor</i> var. <i>pubescens</i>
Rose = <i>B. submoniliformis</i>	( <i>S. Wats.</i> ) <i>I.M. Johnst.</i> ;
„ <i>subtrifoliata</i> Rose = <i>B. subtrifoliata</i>	sp. excl., p. 382
„ <i>tenuifolia</i> (Rose) Rose =	„ <i>discolor</i> var. <i>Veatchiana</i>
<i>B. confusa</i>	( <i>Kellogg</i> ) <i>I.M. Johnst.</i> ;
	sp. excl., p. 383

## XXXVI — CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXVIII.\*

SPECIES NOVAE VEL MINUS COGNITAE MEXICANAE HINTONIANAE.  
—A. A. BULLOCK.

Descriptions of some of Mr. Hinton's Mexican plants have already appeared in this series (K.B. 1936, 1), and in Hooker's *Icones Plantarum*, in addition to an account, based largely on his collections, of the genus *Bursera* (in this number). The following new species and new combinations, together with notes on some other plants, have been worked out while naming this important collection.

Most of the specimens are being collected in a relatively small area, namely, the District of Temascaltepec, situated in the south-western corner of Mexico State and bordering on Michoacan and Guerrero, the adjoining areas in these latter states being worked over to a lesser extent. The flora of the area is extremely rich in species, and the altitude range is from 610 m. at Bejucos to 3450 m. at Las Raices.

The collection now covers over 9000 numbers and is of high scientific value, owing to its being based on intensive exploration of a restricted area.

### RANUNCULACEAE.

***Delphinium bicornutum* Hemsl.** *Diagn. Pl. Nov. pars alt.* 17 (1879), et *Biol. Centr.-Amer.* 1, 9 (1879) ; *Huth in Engl. Bot. Jahrb.* 20, 453 (1895) descr. emend., incl. var. *Hemsleyi* *Huth, l.c.*

STATE OF MEXICO. District of Temascaltepec : Temascaltepec, 1750 m., on a rocky hill, Oct. 1932, *Hinton* 2063 ; *ibid.*, up to 1.5 m. high, Sept. 1934, *Hinton* 6579 ; Peñon-Tule, 1.25 m. high, Sept. 1935, *Hinton* 8293.

The following specimens are also deposited at Kew :— State of Oaxaca, *Ghiesbreght* s.n. (type) ; State of Michoacan, *Arsène* 5763 ; State of Jalisco, *Pringle*, 3862, 11368 ; State of Morelos, *Pringle* 8259.

The bifid spur from which Hemsley took the name of this species is probably a slight abnormality, for other specimens including those collected by Mr. Hinton, which appear to be otherwise identical

\* Continued from preceding article.

have an entire or almost entire spur. A further variable character, also considered to be of specific value by Hemsley, is the hairiness of the stamens. In the type, the stamens are quite definitely pubescent, but among the other specimens cited above, there is a distinct gradation between pubescent stamens and glabrous ones. Huth recognised the variability of the spur character, having examined the Ghiesbreght specimens in the Delessert and Paris herbaria, in addition to the type at Kew; he made the variety *Hemsleyi* for the form with a bifid spur. The present writer does not consider the point to be of sufficient importance to warrant varietal distinction.

#### MENISPERMACEAE.

***Disciphania mexicana* Bullock**, sp. nov.; species mexicana, distincta, foliis magnis profunde lobatis, endocarpio costato papillis paucis inter costis instructo.

*Herba* scandens, probabiliter volubilis, leviter pubescens vel glabra, caulibus gracilibus teretibus longitudinaliter multistriatis internodiis circiter 13 cm. longis. *Folia* herbacea, longe petiolata, petiolis 10–15 cm. longis striatis, ambitu suborbicularia, circiter 20 cm. diametro, profunde palmato-lobata, lobis 4–6 integris vel plus minusve lobulatis, apice acuminatis, utraque pagina leviter pubescentia, sinus basalis profundus clausus. *Inflorescentia* ex axillis foliorum orta, ut videtur spicata; flores masculi . . . . .; flores feminei . . . . . *Infructescentia* circiter 6 cm. longa, dense spicata, pedunculo 1.5 cm. longo. *Fructus* plus minusve ellipsoidei, circiter 1.3 cm. longi et fere 1 cm. diametro; exocarpium carnosum; endocarpium ambitu ovatum, dorsiventraliter concavo-convexum, costis irregularibus longitudinalibus 3 lateralibus et 1 dorsiventralis praeditum, inter costis papillis paucis irregulariter dispersis obtectum.

STATE OF MEXICO. Luvianos, District of Temascaltepec, a vine on the llano, 13 July 1933 (fr. and young ♂ flowers), *Hinton* 4314.

This plant represents an interesting northward extension of the range of the genus, and for this reason it was thought advisable to describe it from the available material though this is somewhat inadequate. Up to the present 12 species have been described, 9 from northern South America, 1 from Haiti, and 2 from Honduras.

The endocarp is very characteristic, having, as in other species of the genus, the general shape of a sector of a hollow sphere; it has three lateral irregular ridges at each side, and one front and back. There are also a few small scattered protuberances between the lateral and median ridges. The specimen cited above shows an infructescence and a very young inflorescence, probably male.

#### CAPPARIDACEAE.

***Cleomella Hemsleyana* Bullock**, nom. nov.—*Cleome mexicana* Hemsl. Diag. Pl. Nov. pars alt. 20 (1879), et Biol. Centr.-Amer. Bot. 1, 41 (1879); non *Cleomella mexicana* Sessé et Moc. ex DC. in DC. Prodr. 1, 237 (1824)

STATE OF OAXACA. "Dunes de la Côte Pacifique", fl. jaunes, *Galeotti* 3194 (type in herb. Kew.).

STATE OF GUERRERO: Acapulco (or vicinity), Oct, 1894—March 1895, *Palmer* 214 (in herb. Kew.)

Although maintaining the genus *Cleomella* in the "Biologia," Hemsley described this plant as a species of *Cleome*, section *Physos-temon*. The trapeziform fruit renders the above transference necessary.

#### CARYOPHYLLACEAE.

***Drymaria grandis* Bullock**, sp. nov.; inter species congeneres habitu elatiore, floribus pro rata maximis distincta.

*Herba* elata ut videtur perennis, plus minusve scandens, usque ad 3 m. alta, glabra, vel primum parce puberula, ramosa. *Folia* opposita, petiolis 5–8 mm. longis praedita, ambitu plus minusve rotundata, usque ad 2 cm. diametro, apice breviter cuspidata, basi rotundata usque breviter cuneata, e basi 3-nervia, venis secundariis haud distinctis, utraque pagina glabra vel fere glabra, leviter discoloria; stipulae subulato-lanceolatae, parvae. *Flores* in cymis terminalibus paniculiformibus plus minusve pedunculatis plus minusve glanduloso-puberulis dispositi; bractae parvae, triangulari-lanceolatae, 3 mm longae, acutae; pedicelli 7–12 mm. longi, in statu fructifero reflexi. *Sepala* 5, lanceolata vel ovato-lanceolata, 6.5 mm. longa, 2.5 mm. lata, acuta, 3-nervia, marginibus albidis scariosis. *Petala* 5, alba, obtriangularia, 8 mm. longa, apice truncata, profunde 3-fida, lobis plus minusve denticulatis. *Stamina* 5, inclusa, filamentis 6 mm. longis, antheris linearibus 0.75 mm. longis. *Ovarium* ambitu rotundatum 1.5 mm. diametro, apice plus minusve emarginatum, longitudinaliter 3-sulcatum; stylus apice trifidus, vix 1 mm. longus. *Capsula* ambitu oblonga, 6 mm. longa, in valvis 3 apice truncatis dehiscens. *Semina* 20–25, brunnea, testa prominente papillosa, reniformi-globosa a latere compressa, 0.75 mm. diametro; embryo periphericus.

STATE OF MEXICO. District of Temascaltepec: Comunidad, April 1932, *Hinton* 508; *ibid.*, 2300 m., in a barranca, Oct. 1933, *Hinton* 4919; *ibid.*, 2440 m., in a wet barranca "leaning on other plants", Jan. 1934, *Hinton* 5427 (type); Los Hornos, 2500 m., common in damp sites at this altitude, "a vine-like herb 3 m. high leaning on other plants", Nov. 1933, *Hinton* 5074; *ibid.*, 2550 m., Jan. 1934, *Hinton* 5429; *ibid.*, 2600 m., in a pine forest, Dec. 1932, *Hinton* 2811.

Besides the above species, which is remarkable for the great size it attains, Mr. Hinton has collected *Drymaria cordata* Willd., *D. gracilis* Cham. et Schlecht., *D. longepedunculata* S. Wats., *D. pauciflora* Bartl., and *D. villosa* Cham. et Schlecht. all in the same district.

#### HYPERICACEAE.

***Hypericum Spragueanum* Bullock**, nom. nov.—*H. fastigiatum* H.B. K. Nov. Gen. et Sp. 5, 195 (1822); Hemsl. Biol. Centr.—Amer.

Bot. 1, 83 (1879); non S. Elliot, Sketch Bot. S. Carolina and Georgia, 2, 31 (1821).

STATE OF MEXICO. District of Temascaltepec: Cerro Muñeca,  $\pm$  2300 m., Aug. 1932, *Hinton* 1361; Tejupilco, 1340 m., Aug. 1933, *Hinton* 4600.

Barnhart\* has discussed the dates of publication of the several parts of each of the works in which the name *Hypericum fastigiatum* was proposed. On his evidence, which appears to be conclusive, the Mexican plant requires a new name.

**Hypericum Hintoni** *Bullock*, sp. nov.; *H. paucifolio* S. Wats. similis sed foliis subulato-linearibus numerosioribus (internodiis brevioribus), paginis haud pellucido-punctatis sed ductibus longitudinalibus resinosis praeditis satis distincta.

*Herba* perennis, glabra, circiter 40 cm. alta; caules simplices vel apicem versus (regione florifero) leviter ramosi, manifeste 4-angulati, angulis plerumque angustissime alati, internodiis circiter 1.5 cm. longis manifeste resinoso-punctatis. *Folia* opposita, decussata, lineari-subulata, usque ad 3.5 cm. longi et basi 2.5 mm. lata, sed plerumque minora, apice acuta, nervis lateralibus venisque haud distinctis, sed ductibus longitudinalibus resinosis manifeste lineata, et interdum marginaliter parce pelludico-punctata, superne valde redacta et bracteiformia. *Flores* cymosae vel ex axillis foliorum redactorum solitaires, in paniculis paucifloris terminalibus dispositi: pedicelli 2.4 mm. longi. *Sepala* 5, lanceolata, acuta, 3 mm. longa. *Petala* 5, obovata, apice rotundata, 5 mm. longa. *Stamina* numerosa, basi in phalangibus 5 disposita, filamentis 3 mm. longis, antheris globosis vix 0.5 mm. diametro. *Ovarium* ellipsoideum, 2 mm. longum, 1 mm. diametro; styli 3, divergentes, 1.5 mm. longi. *Capsula* ellipsoidea, acuta, 7.5 mm. longa, 2.5 mm. diametro, in valvis 3 dehiscens. *Semina* numerosa, rubro-brunnea, cylindrica, vix 1 mm. longa, papillis minutis multiseriatis longitudinaliter lineata.

STATE OF MEXICO. District of Temascaltepec: Puerto Salitre, 1300 m., Sept. 1932, *Hinton* 1796 (type); Nanchititla, llano, Aug. 1934, *Hinton* 6518; Cañitas-Salitre, Aug. 1934 ("see 1796 from same place"), *Hinton* 6731.

This is very similar to *H. paucifolium* S. Wats. in habit, but is strikingly different in its leaves. The inflorescence is also laxer and forms a much less distinct panicle owing to the gradual reduction of the leaves to bracts, a change which is abrupt in *S. paucifolium*.

#### THEACEAE.

**Ternstroemia Pringlei** (*Rose*) *Standley* in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 4, 234 (1929). *Taonabo Pringlei* *Rose* in Contr. U.S. Nat. Herb. 8, 322 (1905), *Standl.* in Contr. U.S. Nat. Herb. 23, 821 (1923).

\* Barnhart in Bull. Torrey Club, 28, 680 (1901) et l.c. 29, 585 (1902).

STATE OF MORELOS. Sierra de Tepoxtlán, 2250 m., a small tree, Mar. 1899, *Pringle* 8013 (type number in Herb. Kew.) woodlands above Alarcon station, 1800 m., June 1904, *Pringle* 11932.

STATE OF MEXICO. District of Temascaltepec: Rincón mine, a tree, Feb. 1932, *Hinton* 281; Rincón, 2060m. at the top of the "Tuna" hill, May 1932, *Hinton* 646; *ibid.*, 1960 m., March 1934, *Hinton* 5606; Las Mesas, 2000 m., on a dry hill, a small tree, the preferred site of many orchids, April 1933, *Hinton* 3728; Cumbre, 2800 m., tree 10 m. high, with *Alnus*, *Quercus*, *Pinus*, etc., April 1934, *Hinton* 5914.

Also (*teste* Standley) in the state of Michoacan.

VERNACULAR NAME. Trompillo (*Hinton*).

The specimens collected by Mr. Hinton indicate that the position of the bracteoles, used by Standley as key character, is of no value for diagnostic purposes.

**Eurya Benthamiana** *Bullock*, nom. nov.—*Freziera integrifolia* Benth. Pl. Hartw. 6 (1839). *Cleyera integrifolia* (Benth.) Planch. ex Choisy in Mém. Soc. Phys. Genève, 14, 112 (1855); Hemsl. Biol. Centr.-Amer. Bot. 1, 93 (1879). *Eurya integrifolia* (Benth.) Szyszyl. in Engl. et Prantl, Nat. Pflanzenfam. 3, 6, 189 (1893), non Blume (1856). *E. mexicana* Standl. in Contr. U.S. Nat. Herb. 23, 823 (1923) partim, quoad syn. tantum, non *Tristylidium mexicanum* Turcz. (1858) nec *Eurya mexicana* (Turcz.) Szyszyl. (1893).

This species is distinguishable by its velutinous sepals from its nearest ally, *E. syphilitica* (Choisy) Szyszyl. and also from *E. mexicana* (Turcz.) Szyszyl., with which Standley united it. From the latter it also differs in its larger, less numerous flowers, and its entire leaves. *Eurya Benthamiana* is represented at Kew only by the type specimen, collected by Hartweg (no. 18) at Bolanos, Zacatecas, in 1839.

**Eurya syphilitica** (Choisy) Szyszyl. in Engl. et Prantl, Nat. Pflanzenfam. 3, 6, 189 (1893). *Cleyera syphilitica* Choisy in Mém. Soc. Phys. Genève. 14, 112 (1855). *Ternstroemia syphilitica* Pavon ex Choisy l.c. in syn.

STATE OF MEXICO. District of Temascaltepec: Rincón, Feb. 1932 (fl.), *Hinton* 116, 282; El Crucero, 2880 m., a tree, July 1932 (fr.), *Hinton* 1099. La Labor, a tree 15 m. high, July 1935 (fl.), *Hinton* 7704; *ibid.*, Feb. 1935 (fr.), *Hinton* 7227; Comunidad, tree 10 m., Aug. 1935 (fl.), *Hinton* 7990. "Fruit edible".

VERNACULAR NAME. Capulincillo (*Hinton*).

Standley omitted this species from his "Trees and Shrubs of Mexico"; it had also been omitted from Hemsley's enumeration in the Biologia Centrali-Americana.

**Eurya Hintoni** *Bullock*, sp. nov.; *E. syphiliticae* (Choisy) Szyszyl. affinis, sed foliis floribusque minoribus, antheris longius apiculatis pedunculis apice bibracteolatis differt.

*Arbor* sempervirens, 10 m. alta, ramis ramulisque glabris sed lenticellis numerosis tuberculatis. *Folia* coriacea, glaberrima, anguste

elliptica vel rarius ovata, 4–8 cm. longa, 1.5–3 cm. lata, apice obtuse sub-acuminata, basi subcuneata, supra nitida, subtus nervis laterali-bus (utrinsecus 5–9) venisque manifestis reticulata ; petioli 1–3 mm. longi. *Flores* numerosi, ex axillis foliorum maturorum vel delapsorum orti, 1–3-nati ; pedunculi satis graciles, circiter 1 cm. longi, apice bibracteolati ; bracteolae suboppositae, triangulari-ovatae, circiter 0.5 mm. longae, plus minusve ciliatae ; receptaculum (supra bracteae) plus minusve turbinatum, 2 mm. altum, 1.5 mm. diametro. *Sepala* 5, biseriata, 3 exteriores semielliptica, apice rotundata, marginibus pilis paucis ciliata, ceterum glabra, 2 interiores rotundato-ovata, omnino glabra ; omnia circiter 2 mm. longa et 2 mm. lata, sub anthesin patentes. *Petala* 5, rotundato-obovata, 5 mm. longa, 4 mm. lata, sub anthesin patentes, marginibus plus minusve incurva. *Stamina* circiter 30, in annulo corollae basi inserta ; filamenta tota 3.5 mm. longa, circinnatim incurva ; antherae 1 mm. longae, connectivo in apiculo fere 1 mm. longo producto. *Ovarium* globosum, fere 1.5 mm. diametro, leviter breviter pilosum. *Styli* 2, lineari-filiformes, 3 mm. longi. *Fructus* non visi.

State of MEXICO. District of Temascaltepec : Mina de Agua, in a barranca, a tree 10 m. high, Nov. 1935 (fl.), *Hinton* 8653.

### XXXVII—MISCELLANEOUS NOTES

MR. ALFRED H. COCKAYNE.—We note with interest that Mr. A. H. Cockayne, son of the late Dr. Leonard Cockayne, C.M.G., F.R.S., who has been Assistant Director-General of the Department of Agriculture, New Zealand, since 1929, has been appointed Director-General in succession to Dr. C. J. Reakes.

In 1927 Mr. Cockayne was appointed Director of the Plant Research Station on its establishment and he retained this post during his tenure of the office of Assistant Director-General.

SIR LIONEL PHILLIPS.—Botany in South Africa has sustained an irreparable loss in the death of Sir Lionel Phillips, Bart., at his home near Somerset West, South Africa, on July 2nd, at the advanced age of 80. After a long and adventurous life in the South African goldfields, he became keenly interested in all matters pertaining to Agriculture and Horticulture, in which interests he was ably supported by Lady Phillips, who is herself an enthusiastic gardener. Thanks to Sir Lionel's assistance and influence, the late Professor Pearson's scheme for establishing a Botanic Garden at Kirstenbosch was realised. When Sir Lionel represented Yeoville, Transvaal, in the South African Parliament (1910-1915), he moved the following resolution : " That in the opinion of this House, the Government should consider the advisability of setting aside a piece of ground at Kirstenbosch for the establishment of a National Botanic Garden." The motion received unanimous support from the House, and the Government promptly acted in accordance therewith.

Sir Lionel was also a life-member of the Botanical Society of South Africa, having acted as Vice-President since its foundation in 1913, and as Chairman of the Council since 1927. To his constant interest and support the Society owes much of its success.

At their beautiful home, "Vergelegen", Sir Lionel and Lady Phillips for some years have carried out interesting farming experiments. Their library, which was housed in the converted old Cape-Dutch wine store, contained a valuable collection of books on various branches of natural history.

Sir Lionel was also very fond of music and the fine organ he had built in his library added greatly to its interest.

**FREDERICK JOHN FRESHWATER SHAW.**—The sudden death at Agra, announced in the London papers of 31st July last, of Dr. F. J. F. Shaw, C.I.E., A.R.C.S., F.L.S., Director of the Imperial Institute of Agricultural Research, Pusa, removes one of the few members remaining in India who were associated with the early days of the Indian Agricultural Service.

Dr. Shaw joined the Service in 1910, after completing his research training in botany and plant pathology at the Royal College of Science. He was posted to Pusa as Supernumerary Mycologist and engaged in plant pathological research for which he received the degree of D.Sc. (London). In 1913 he served as Government Mycologist in Madras, but returned to Pusa as Second Imperial Mycologist in 1915. In 1928 he became Imperial Economic Botanist and in 1934 Director of the Pusa Institute. In this capacity he was responsible for the arrangements for the transfer of the Imperial Agricultural Research Institute, destroyed by the Bihar Earthquake, to its new home near Delhi. It was during one of the journeys in connection with this transfer that he lost his life from apoplexy brought on by the heat of the Indian plains at that time of the year. He had been at Simla, acting as Agricultural Expert with the Imperial Council of Agricultural Research, for some time prior to his death.

Dr. Shaw, who was fifty at the time of his death, was educated at St. Olave's Grammar School, London. He received the C.I.E. this year. He published a number of papers on plant pathology and plant breeding, mainly in the Memoirs and other publications of the Department of Agriculture in India.

E. J. BUTLER.

**Centenary of the University of London.**—The Director attended the Centenary Celebration on Monday, June 29th, when the Chancellor received the Delegates to the number of 190 and conferred the Honorary Degrees. The Delegates presented Addresses of Congratulation and the following address was presented by the Director from the Royal Botanic Gardens, Kew.



**On the Occasion  
of the  
Centenary of the University of London.**

**The Director and Staff of The Royal Botanic Gardens, Kew,** offer their sincere congratulations, fully recognizing the great work which the University has done in stimulating and encouraging University Education, not only in England but throughout the Empire.

The Royal Botanic Gardens are proud of their many connections and points of contact with the University, since in attempting to display the botanical resources of the world, and of the Empire in particular, Kew may be considered ancillary to the University in many of its spheres of activity.

We look forward to the future of the University in its new home and offer our best wishes for the continued spread of its beneficent influence.

It is our earnest wish that the students of the University may always find refreshment for mind and fresh sources of inspiration during their studies and their leisure among the beauties of Nature at Kew.

June 27th, 1936.

ARTHUR W. HILL  
Director.

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**Centenary of the Botanical Society of Edinburgh.**—The Centenary meeting of the Society was held at Edinburgh on July 1st, in the Lecture Hall of the Royal Botanic Garden. The Delegates were received by the President, Sir William Wright Smith, F.R.S.E., at 10 a.m., when addresses were presented. The Director was the official delegate from Kew and presented the following address of congratulation : —

**From  
The Royal Botanic Gardens, Kew  
to  
The Botanical Society of Edinburgh  
Greeting.**

On the auspicious occasion of your Centenary we gratefully recall how your Society, from its foundation, has promoted the study of Systematic Botany under the stimulus of your first President, Robert Graham, and of such eminent botanists as Robert Kaye Greville, John Hutton Balfour, Hewett Cottrell-Watson, William Lauder Lindsay and Richard Spruce.

The impetus thus given to the study of Botany has been ably sustained during the past hundred years of your existence and has covered a wide field of botanical investigation, especially among the Cryptogams, both at home and abroad.

Not only has the Society published important monographs, but it has also encouraged the publication of many smaller papers, the interest and value of which, coupled with the flourishing condition of your membership are a fine testimony to your vigour.

It is, we feel, a happy augury for the future that your Secretary is a member of the Clan of your original President, and in tendering you our Congratulations we also offer you our Good Wishes for your continued usefulness and prosperity.

July 1st, 1936

ARTHUR W. HILL  
Director.

Emeritus Prof. F. O. Bower, F.R.S., then delivered a very interesting address dealing with the progress of the Science of Botany during the century of the Society's existence in its relation to the history of the times. The Centenary Luncheon was given in the Upper Library of the Old College. The Lord Provost and many other distinguished visitors were present. Lord Aberconway proposed the toast of the City of Edinburgh, Professor Sir Albert Seward that of the Society, and the Director responded on behalf of The Guests.

The afternoon was spent in visiting the Royal Botanic Garden and the botanical exhibition which had been arranged in the Laboratory.

In the evening there was a civic reception by the Lord Provost and the Corporation in the City Chambers.

**Chronica Botanica.**†—Greatly increased specialisation is characteristic of modern scientific research, with the result that workers in one branch are often badly informed as to developments in other departments of their own science. Except in the United States of America, where a system of exchange of research programmes is in operation, there is little opportunity to exchange notes on current investigations. *Chronica Botanica*, now in its second year, was founded primarily to collect and publish such programmes.

The second volume maintains the high standard set by its predecessor. The main body of the book (pp. 65-369) is devoted to a review of all branches of plant science for the year 1935, no information being reprinted from the previous volume. This section gives all the scientific and personal news collected up to the end of January 1936, and at the same time forms an up-to-date list of the addresses of all institutions and societies in any way concerned with pure or applied botany.

Here only a few examples can be given of the varied information supplied in this section. In Alaska, weed control in the grain fields is becoming a major problem, while in Hungary the increase in the growing of arable crops, accompanied by a ploughing up of the better grassland areas, has caused a serious diminution in the

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† *Chronica Botanica*, edited by Fr. Verdoorn. Volume II. (*Chronica Botanica*, Ltd., P. O. Box 8, Leiden, Holland, 1936). Pp. 479, and numerous portraits and illustrations in the text. Price 15 guilders. London Agents: H. K. Lewis and Co., 136 Gower Street, W. C. 1.

extent and quality of the pastures. The task with which Hungarian grassland farmers are now faced is to improve the nutritive value of their grazing grounds, and thus to reduce the costs of obtaining animal products. It is generally assumed that the future of Brazil is closely bound up with the development of cotton cultivation, and a national cotton research association is now projected in that country. In France, a new nature reserve has been established in the central Pyrenees, under the direction of Dr. P. Chouard. The area consists of 21 square kilometres of mountainous country, between 1750 and 3090 m. in altitude, and is intended not only for the protection of the native flora and fauna, but for investigations in mountain biology. Various nature reserves have also been established in Java, Sumatra and Borneo. Numerous illustrations reproduced from photographs include portraits of recently deceased botanists, e.g. Cardot, Jumelle, Flahault, Loeske, Hans Meyer, O. V. Darbishire, F. Escombe, John Fraser, Paul Brühl, Ugolino Martelli, Hugo de Vries, F. A. F. C. Went, Hugo Dahlstedt, F. G. Stebler, A. Fomin, A. S. Hitchcock and B. L. Robinson, accompanied by brief obituaries. Portraits of deceased collectors include those of Père Vanderijst, Chaplain Clemens and W. E. Broadway, and others represent botanists who have received new appointments, e.g. E. J. Butler, G. W. Turesson, E. D. Merrill, M. L. Fernald and M. A. Howe.

The editorial article is devoted to an account of the little-known Botanical Section of the International Union of Biological Sciences, while the results of the Sixth International Botanical Congress, Amsterdam (1936), are summarized in pp. 27-41. Notices of international and important congresses, committees, societies and institutions occupy pp. 42-64. Other useful features are Discussions and Announcements (370-374), New Periodicals (376-378), and New and Changed Addresses (379-406). The volume ends with separate Indexes of Place Names, Plant Names and Persons (444-479). No important botanical institution can afford to be without it.

T. A. SPRAGUE.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 7 1936 ROYAL BOTANIC GARDENS, KEW

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## XXXVIII—PRELIMINARY LIST OF FUNGI AND DISEASES OF PLANTS IN SIERRA LEONE. F. C. DEIGHTON. (Plant Pathologist, Agricultural Department, Sierra Leone).

Nearly all the records here listed have been made since 1926 by the author, and the fungi have been identified by the staff of the Imperial Mycological Institute. A few records were made in 1925 by Dr. V. C. Dunlap, who visited Sierra Leone as representative of Messrs. Elders and Fyffes, and by Mr. G. H. Jones, then Mycologist, Department of Agriculture, Nigeria : in these cases their authority for the record is given.

Each record shows the name of the host plant, the part affected, the organism or disease, the locality (town and chiefdom) and date of collection, and the collection number of the specimen, material of which has been sent to the Imperial Mycological Institute. In a few cases no such collection has been made and no number is therefore quoted : this applies especially to certain records of common omnivorous fungi. Collection numbers (author's collection) of host plants are given in a few cases where the specific name is not known : these refer to material in the Herbarium of the Royal Botanic Gardens, Kew.

It has been observed that the omnivorous fungi *Corticium* (*Rhizoctonia*) *Solani* and *Sclerotium* "*Rolfsii*" occur very rarely on wild host plants. Records of *Corticium Solani* on wild host plants have only been listed in cases of definite attack which is not merely the result of spread from contact with affected cultivated plants : there are only six such records. *Sclerotium* "*Rolfsii*" has not been seen attacking a wild host plant except very rarely in spreading over the soil from a diseased cultivated plant. Records of the thread-blight fungi (*Marasmius* spp.) on wild host plants are numerous but are not included in the list. The "red rust" alga (*Cephaleuros*), which is common on the leaves of a large number of wild and cultivated plants, has only been included in the list when its attack has been recorded as severe. Records of attack by the root-knot nematode (*Heterodera Marionii* (Corn.) Good.), which is often severe on garden plants, have not been listed.

It is probable that certain fungi (especially *Polyporaceae*) which in Sierra Leone have been recorded so far only as saprophytes, are facultative parasites. The names of those so far recorded will be found in the "List of Fungi collected in Sierra Leone" published in this same number of the Bulletin.

***Adenia cissampeloides* Harms.**

On leaves : *Aecidium bomolense* Syd. Makump (Mapaki), 23.8.28, M 213 ; Njala (Kori), 25.7.33, M 711 ; Baiima (Gbo), 23.9.35, M 819.

***Adenia lobata* Engl.**

On leaves : *Aecidium bomolense* Syd. Allen Town (Colony), 1.6.33, M 459.

***Afzelia bracteata* Vog.**

On leaves : *Meliola bicornis* Winter. Njala (Kori), 18.3.33, M 443.

***Agave sisalana* Perrine, Sisal.**

On leaves : "Sun scorch ". Physiological.

***Ageratum conyzoides* Linn.**

In stem : *Fusarium oxysporum* Schlecht. Wilt. Njala (Kori), November 1933.

***Albizzia gummifera* C. A. Smith.**

On leaves : *Meliola bicornis* Winter. Njala (Kori), 2.12.33, M 497.

***Albizzia zygia* Macbride.**

On leaves : *Meliola bicornis* Winter. Njala (Kori), 26.2.33, M 435 ; Batkanu (Gombahun), 15.1.34, M 580A. *Oidium* sp. Hill Station (Colony), 19.5.35, M 715.

***Allium ascalonicum* Linn., Native Shallot.**

On leaves : *Cercospora Duddiae* Welles. Makump (Mapaki), 8.2.29, M 256.

***Allium Cepa* Linn., Onion.**

On leaves : *Cercospora Duddiae* Welles. Makump (Mapaki), 8.2.29, M 257.

***Amaranthus caudatus* Linn., " Spinach " or " Bush Greens ".**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 25.11.30, M 337B.

***Anchomanes difformis* Engl.**

On leaves : *Cercospora* sp. Njala (Kori), 13.7.28, M 289.

***Andropogon gabonensis* Stapf.**

On leaves : *Puccinia Andropogonis* Schw. Newton (Colony), 26.6.35, M 740A.

**Andropogon tectorum Schum.**

On leaves : *Puccinia Andropogonis* Schw. Rokupr (Samu), 28.1.35, M 692 ; Newton (Colony), 15.11.28, M 222 ; Makump (Mapaki), 3.5.29, M 274.

**Angelonia grandiflora C. Morr.**

On stem : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Anthocleista Frezoulsii A. Chev.**

On leaves : *Puccinosira Anthocleistae* P. Henn. Njala (Kori), 5.1.34, M 571.

**Anthocleista nobilis G. Don.**

On leaves : *Puccinosira Anthocleistae* P. Henn. Hill Station (Colony), 31.12.26 ; Njala (Kori), 5.1.34, M 572.

**Arachis hypogaea Linn.,** Groundnut.

Mosaic diseases, including " rosette " (virus diseases). Common everywhere.

On leaves, stems and fruit " pegs " ; *Cercospora personata* (Berk. & Curt.) Ell. & Ev. Njala (Kori), 12.10.33, M 488. Common everywhere. *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori), Mapaki (Mapaki), Bunbuna (Dansogoia), Binkolo (Safroko Limba), August 1928.

**Artocarpus integrifolia Linn.,** Jak-fruit.

On leaves : *Botryodiplodia Theobromae* Pat. Njala (Kori), 1.5.29, M 283.

**Asclepias curassavica Linn.**

On blossoms, and causing die-back of stems : *Choanephora* sp. Njala (Kori), April 1932.

**Aster laevis Linn.**

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori), October 1933.

**Avicennia nitida Jacq.**

On leaves : *Irenina sepulta* (Pat.) Stev. Gbangbaia (Banta), 19.11.31, M 358.

**Bauhinia acuminata Linn.**

On fruit : *Colletotrichum gloesporioides* Penz. Njala (Kori), 13.1.35, M 685.

**Bauhinia tomentosa Linn.**

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori), April 1932.

**Begonia sp.** (Garden ornamental).

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori), November 1932, M 405.

**Beta vulgaris Linn.**, Beet.

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 2.7.35, M 752.

**Bignonia magnifica Bull.**

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori), July, 1935.

**Blepharis maderaspatensis Heyne.**

On leaves : *Aecidium Blepharidis* Har. & Pat. Hill Station (Colony), 31.12.26, M 125 ; Njala (Kori), 21.1.35, M 686 ; Robot (Samu), 6.8.35, M 782. Common.

**Boerhaavia diffusa Linn.**

On leaves : *Cercospora* sp. Yoni (Sitia), 19.3.32, M 385.

**Borreria ramisparsa D.C.**

On leaves : *Puccinia lateritia* Berk & Curt. Njala (Kori), 14.9.26, M 30 ; Baiima (Gbo), 25.9.35, M 821. Rokupr (Samu), November 1935, M 821A. Common.

**Borreria verticillata (L.) G. F. W. Mey.**

On leaves : *Puccinia lateritia* Berk. & Curt. Rotifunk (Bumpe), 26.4.32, M 392.

**Brachiaria distichophylla Stapf.**

On leaves : *Uromyces leptodermus* Syd. Lumley (Colony), 20.10.29, M 284.

**Brachycorythis Kalbreyeri Rchb. f. var. glandulosa Braid.**

On leaves: *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Brassica Rapa Linn.**, Turnip.

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 27.5.27, M 148. *Macrophomina Phaseoli* (Maubl.) Ashby. Njala (Kori), 4.7.28, M 233.

**Brassica oleracea Linn.**, Cabbage, Kohlrabi, etc.

On leaves : *Alternaria circinans* (Berk. & Curt.) Bolle. Njala (Kori), 22.12.30, M 321A and B. *Corticium Solani* (Prill. & Del.) Bourd & Galz. Njala (Kori), 25.11.30, M 337E. *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Cajanus Cajan Millsp.**, Pigeon Pea.

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Form with large sclerotia, Njala (Kori), 21.7.31, M 349 ; form with small sclerotia, Njala (Kori), 21.7.31, M 349A. *Uredo Cajani* Syd. Njala (Kori), 15.10.28, M 212.

On stems : *Stilbum nanum* Mass., probably. Njala (Kori), January 1932, M 372.

**Caladium bicolor Vent.**

On leaf stalks : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Callichilia subsessilis Stapf.**

On leaves : *Cercospora* sp. Njala (Kori), 24.12.28, M 245.

**Calonyction muricatum G. Don.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd & Galz. Njala (Kori). *Sclerotium* sp. of *S. Rolfsii* group. Leaf spot of cotyledons. Njala (Kori).

**Calopogonium mucunoides Desv.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Canavalia ensiformis DC.**, Sword Bean.

Mosaic (virus).

On cotyledons : *Neocosmospora vasinfecta* E. F. Smith. Newton (Colony), June 1935.

On leaves : *Cercospora Canavaliae* Syd. Njala (Kori). 23.12.33, M 575, and 22.1.34, M 575A.

On stems and leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori), June 1935.

**Canna spp.** Garden Canna.

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

In stems : Wilt. (*Bacterium* ? *Solanacearum* E.F.Sm.). Njala (Kori), July 1935.

**Capsicum annum Linn.**, Peppers.

Leaf Crinkle (virus). Common probably everywhere.

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

On fruit : *Colletotrichum Capsici* (Syd.) Eutl. & Bisby. Njala (Kori), July 1928. *Glomerella cingulata* (Stonem.) Spauld & von Schrenk. Njala (Kori). Common.

**Capsicum frutescens Linn.**, Chillies.

Leaf Crinkle (virus). Common probably everywhere.

On stems : *Choanephora* sp. Causing die-back, Njala (Kori),



July 1928. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 2.1.31, M 337D. *Glomerella cingulata* (Stonem.) Spauld. & von Schrenk. Njala (Kori).

**Cardiospermum Halicacabum Linn.**

On leaves : *Cercospora* sp. Njala (Kori), 19.4.34, M 644.

**Carica Papaya Linn.**, Papaw.

In roots : *Macrophomina Phaseoli* (Maubl.) Ashby. Njala (Kori), 1933. *Sphaerostilbe repens* Berk. & Br. Njala (Kori), 22.10.35, M871A

In stems : *Phytophthora parasitica* Dastur emend. Ashby. Njala (Kori). July 1935.

On leaves : *Oidium* sp. On seedlings in shade. Njala (Kori), 2.4.35, M 706.

On fruit : *Botryodiplodia Theobromae* Pat. *Colletotrichum Capsici* (Syd.) Butler & Bisby. *Glomerella cingulata* (Stonem.) Spauld & von Schrenk. *Helminthosporium gigasporum* Berk. & Br. subsp. *javanicum* Penz. & Sacc. *Phoma* sp. Njala (Kori), January 1934, M 599.

**Cassia Sieberiana DC.**

On leaves : *Cercospora* sp. Njala (Kori), 23.10.33, M 506. *Mimema* sp., or near this genus. Njala (Kori), 30.11.34, M 660.

**Cathormion altissimum Hutch. & J. E. Dandy.**

On trunk : *Fomes yucatanensis* (Murr.) Sacc. & D. Sacc. Njala (Kori), 12.2.28, M 181 ; 7.7.31, M 347.

**Celosia argentea Linn.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), August, 1935. Uncommon.

**Centrosema Plumieri Benth.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. Galz. Njala (Kori), July 1935.

**Cercestis congoensis Engl. ?**

On leaves : *Cercospora* sp. Njala (Kori), 25.4.35, M 645.

**Chasmopodium caudatum Stapf.**

On inflorescence : *Balansia* sp. Near Kabala (Warawara Yagala), 16.11.30, M 314. *Ustilago flagellata* Syd. Near Juring (Gbema), 1.12.26, M 95 ; Tombo (Mambolo), 8.1.28, M 169 ; Magburaka (Kolifa Rowala), 6.5.29, M 273A ; Bendugu (Sengbe), 22.4.29. M 273B, very abundant ; Kamiototo (Tamiso), 11.11.30, M 312 Tabe (Kowa), 22.9.35, M 835.

**Chlorophora excelsa Benth. & Hook. f.**

On leaves : *Cercospora* sp. Njala (Kori), 25.3.33, M 449.

**Christiana africana DC.**

On leaves : *Cercospora* sp. Njala (Kori), 22.1.34, M 577.

**Chrysanthemum sinense Sabine**, Florists' Chrysanthemum.

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Cinnamomum zeylanicum Nees**, Cinnamon.

On leaves : *Rhinotrichum* sp. Njala (Kori), 4.7.35, M 750.

**Cissus Afzelii Gilg & Brandt.**

On fruit : *Oidium* sp. Baiima (Gbo), 24.9.35, M 836.

**Citrullus vulgaris Schrad.**, Water Melon.

On leaves : *Cercospora citrullina* Cooke. Newton (Colony), 1.2.35, M 701. *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori). Rare.

**Citrus aurantifolia Swingle**, Lime.

On leaves : *Sphaceloma Fawcettii* Jenkins (*Sporotrichum Citri* Butl.). On Tahiti lime, Newton (Colony), 15.12.33, M 638.

On fruit : Scabby lesions, rare, Njala (Kori), September 1933, M 620. Cause doubtful.

Fruit rots : *Aspergillus niger* van Tiegh. *Colletotrichum gloeosporioides* Penz. *Diplodia natalensis* Pole Evans. *Oospora Citri-Aurantii* (Ferrar.) Sacc. & Syd.

**Citrus Aurantium Linn.**, Sour Orange.

On leaves : *Septobasidium* sp. Near Njala (Kori), 26.12.33, M 585.

On leaves and fruit : *Sphaceloma Fawcettii* Jenkins (*Sporotrichum Citri* Butl.). Njala (Kori), 27.1.29, M 643 ; Newton (Colony).

Fruit rots : *Diplodia natalensis* Pole Evans. *Oospora Citri-Aurantii* (Ferrar.) Sacc. & Syd.

**Citrus Limonia Osbeck**, Lemon.

On leaves : *Cephaleuros mycoidea* Karst. On rough lemon, Njala (Kori), January 1934. *Colletotrichum gloeosporioides* Penz. Njala (Kori). *Septobasidium* sp. Njala (Kori), 4.12.28, M 253. *Sphaceloma Fawcettii* Jenkins (*Sporotrichum Citri* Butl.). Njala (Kori), 29.12.33, M 641 and 642 ; Newton (Colony), Batkanu (Gombahun).

On trunk : Foot rot. Cause not determined. Njala (Kori), Batkanu (Gombahun), Newton (Colony).

On fruit : *Sphaceloma Fawcettii* Jenkins (*Sporotrichum Citri* Butl.).

Fruit rots : *Aspergillus niger* van Tiegh. *Diplodia natalensis* Pole Evans. Njala (Kori), January 1934, M 600. *Oospora Citri-Aurantii* (Ferrar.) Sacc. & Syd. *Penicillium digitatum* Sacc.

**Citrus medica Linn.**, Citron.

On leaves : *Colletotrichum gloeosporioides* Penz. Njala (Kori).

**Citrus nobilis** Lour. var. *deliciosa* Swingle, Tangerine & Mandarin.

On leaves and fruit : *Sphaceloma Fawcettii* Jenkins (*Sporotrichum Citri* Butl.). Njala (Kori), Newton (Colony).

Fruit rots : *Aspergillus niger* van Tiegh. *Colletotrichum gloeosporioides* Penz. *Diplodia natalensis* Pole Evans. *Oospora Citri-Aurantii* (Ferrar.) Sacc. & Syd. *Penicillium digitatum* Sacc. *Penicillium italicum* Wehm. *Mycotorula* sp. and *Saccharomycodes Ludwigii* Hansen are commonly associated with rots following fruit-piercing lepidoptera.

**Citrus nobilis** Lour. var. *Unshiu* Swingle, Satsuma.

On leaves and fruit : *Sphaceloma Fawcettii* Jenkins (*Sporotrichum Citri* Butl.). Njala (Kori), 23.12.32, M 640.

**Citrus paradisi** Macf., Grapefruit.

On leaves : *Colletotrichum gloeosporioides* Penz. Njala (Kori), 6.12.28, M 243 ; Newton (Colony), June 1935, M 773. *Septobasidium* sp. Njala (Kori), 4.12.28, M 253. *Sphaceloma Fawcettii* Jenkins (*Sporotrichum Citri* Butl.). Njala (Kori), 2.10.28, M 268. Also at Newton (Colony).

On trunk : Foot rot. Cause not determined. Newton (Colony).

On fruit : *Leptothyrium Pomi* (Mont. & Fr.) Sacc. Fly-speck. Njala (Kori), 29.1.29, M 251. *Sphaceloma Fawcettii* Jenkins (*Sporotrichum Citri* Butl.). Njala (Kori), Newton (Colony).

Fruit rots : *Aspergillus niger* van Tiegh. *Aspergillus Wentii* Wehm. series, on shrivelled fruit in store. *Colletotrichum gloeosporioides* Penz. *Diplodia natalensis* Pole Evans. Njala (Kori), November 1933, M 533. *Fusarium* spp., following punctures by needle or by fruit-piercing lepidoptera. Most strains isolated at Njala were forms of *F. moniliforme* Sheld. var. *subglutinans* Wollenw. & Reink. : *F. Theobromae* App. & Strunk., and *F. oxysporum* Schlecht. were each once isolated. *Hypomyces Ipomoeae* (Halst.) Wollenw. *Oospora Citri-Aurantii* (Ferrar.) Sacc. & Syd. *Penicillium digitatum* Sacc. *Penicillium italicum* Wehm. *Peroneutypella pusilla* Syd., isolated from rot following needle puncture.

**Citrus sinensis** Osbeck, Sweet Orange.

Psorosis. Probably virus. On Late Valencia and Washington Navel. Njala (Kori), 1934.

On trunk : *Phytophthora parasitica* Dastur emend. Ashby. Isolated from foot rot, Njala (Kori), 1929. Foot rot is widely distributed in the country.

On blossoms : *Botrytis cinerea* Pers. Njala (Kori), 7.9.33, M 471.

On fruit and trees : Scabby lesions, very rare, on Valencia orange, Njala (Kori), December 1932, M 416. Possibly *Sphaceloma Fawcettii* Jenkins, but doubtful.

Fruit rots : *Colletotrichum gloeosporioides* Penz. *Diplodia natalensis* Pole Evans. *Fusarium moniliforme* Sheld. var. *subglutinans* Wollenw. & Reink. Several strains isolated at Njala from rots follow-

ing punctures by needle or fruit-piercing lepidoptera. *Oospora Citri-Aurantii* (Ferrar.) Sacc. & Syd. *Penicillium digitatum* Sacc. *Mycotorula* sp. and *Saccharomycodes Ludwigii* Hansen are commonly associated with rots following fruit-piercing lepidoptera.

**Citrus sp., Sweet Lime.**

On leaves: *Sphaceloma Fawcettii* Jenkins (*sporotrichum Citri* Butl.). On a small proportion of seedlings, Newton (Colony), May 1933, M 639.

Fruit rots: *Aspergillus niger* van Tiegh. *Oospora Citri-Aurantii* (Ferrar.) Sacc. & Syd. *Penicillium digitatum* Sacc. *Phytophthora parasitica* Dastur section *macrospora* Ashby. *Mycotorula* sp. and *Saccharomycodes Ludwigii* Hansen are commonly associated with rots following fruit-piercing lepidoptera.

**Clerodendron Buchholzii Gürke.**

On leaves: *Hemileia Scholzii* Syd. Njala (Kori), January 1934, M 570.

**Clerodendron fallax Lindl.**

On leaves: *Cercospora* sp., identical with that on *C. paniculatum*. Njala (Kori), 4.11.33, M 507.

On stems: *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Clerodendron fragrans Vent.**

On stems and leaves: *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

On leaves: *Cercospora* sp. of *C. canescens* type. Njala (Kori), 5.12.34, M 663.

**Clerodendron paniculatum Linn.**

On leaves: *Cercospora* sp., identical with that on *C. fallax*. Njala (Kori), 13.11.33, M 508. *Hemileia Scholzii* Syd. Njala (Kori), 21.10.35, M 865. *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Clerodendron scandens Beauv.**

On leaves: *Cercospora* sp., of *C. canescens* type. Njala (Kori), 27.12.28, M 238, 11.12.34, M 666, and 29.10.35, M 743C; Newton (Colony), 27.6.35, M 743A; Rokupr (Samu), 6.8.35, M 743B. *Hemileia Scholzii* Syd. Njala (Kori), 4.1.29, M 244; Hill Station (Colony), 3.8.35, M 722C; Masanki (Ribi), 1.8.35, M 722B; Rokupr (Samu), 6.8.35, M 722D.

**Cocos nucifera Linn., Coconut.**

On fruit: *Botryodiplodia Theobromae* Pat. Njala (Kori), 28.2.34, M 624. *Fusarium sambucinum* Fuck. Njala (Kori), 28.2.34, M 624.

**Coffea arabica Linn.**

On leaves: *Cercospora coffeicola* Berk. & Cooke. Njala (Kori), 15.6.27, M 159.

***Coffea canephora* Pierre.**

On leaves and fruit : *Cercospora coffeicola* Berk. & Cooke. Njala (Kori) and elsewhere.

***Coffea liberica* Bull.**

On leaves : *Irenina glabra* (Berk. & Curt.) Stev. Near Waterloo (Colony), 11.8.26, M 6. *Pestalozzia Coffeae* Zimm. On unshaded young plants, Kambia (Magbema), 28.12.27, M 173.

On leaves and stem : *Cephaleuros mycoidea* Karst. Makump (Mapaki), 31.3.31. Common on leaves in the Colony and elsewhere. *Marasmius scandens* Mass. White thread. Zimi (Makpeli), December 1930, M 333.

On leaves and fruit : *Cercospora coffeicola* Berk. & Cooke. Njala (Kori) and elsewhere.

***Coffea robusta* Linden.**

On leaves and fruit : *Cercospora coffeicola* Berk. & Cooke. Njala (Kori) and elsewhere.

***Coffea stenophylla* G. Don.**

Witch-broom disease. Cause unknown. Common in the Colony.

On leaves and fruit : *Cercospora coffeicola* Berk. & Cooke. Njala (Kori), Colony, and elsewhere.

***Cola caricifolia* K. Schum.**

On leaves : *Irenopsis guianensis* (Stev. & Dowell) Stev. Njala (Kori), 31.1.33, M 560.

***Cola nitida* A. Chev., Kola.**

On twigs : *Marasmius scandens* Mass. White thread. Between Mabonto and Bumbuna (Simiria), 25.8.28, M 187 ; and elsewhere. Common. *Marasmius* sp. aff. *M. equicrinis* Mull. Horse-hair blight. Peje (Bumpe), 19.4.29, M 279A, and elsewhere. Common. *Pseudomonas* sp. in association with *Fusarium* sp. Causing twig blight. Njala (Kori), 1925, *Dunlap*.

On trunk : *Fomes noxius* Corner. Shian (Bake Loko), March 1930, M 308.

***Cordyline terminalis* Kth. var. *ferrea* Baker.**

On leaves : *Fusarium semitectum* Berk. & Rav. var. *majus* Wollenw. Njala (Kori), 10.12.32, M 410 and 15.1.35, M 410A.

***Coreopsis Drummondii* Torr. & Gray.**

On stems : Wilt. *Bacterium*? *Solanacearum* E. F. Sm. Njala (Kori), 1933. *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

***Coreopsis grandiflora* Nutt.**

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Coreopsis tinctoria Nutt.**

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Cosmos sulphureus Cav.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Crotalaria juncea Linn.,** Sunn Hemp.

On leaves : *Cercospora* sp., apparently *C. canescens* Ell. & Mart. Njala (Kori), 8.7.33, M 463. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 18.9.31, M 354C, and 30.6.31, M 345.

**Crotalaria retusa Linn.**

Mosaic. Probably virus.

On leaves : *Oidium* sp. Hill Station (Colony), 12.8.35, M 705A ; Lumley beach (colony), 28.3.35, M 705B. *Parodiella perisporioides* (Berk. & Curt.) Speg. Newton (Colony), 23.8.31, M 351A ; Tisana (Dema), 15.11.31, M 351B ; Njala (Kori), 10.1.35, M 681. Also at Lumley beach (Colony).

**Cucumis Melo Linn.,** Melon.

On leaves : *Oidium* sp. Njala (Kori).

**Cucumis sativus Linn.,** Cucumber.

On leaves : *Cercospora Cucurbitae* Ell. & Ev. Njala (Kori), 5.12.29, M 300. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), December 1933, M 632. *Oidium* sp. Njala (Kori), Hill Station (Colony), Kenema (Nongowa). *Phyllosticta* sp., possibly *P. Cucurbitacearum* Sacc. Njala (Kori), 5.12.29, M299.

**Cucurbita Pepo Linn.,** Pumpkin.

On leaves : *Oidium* sp. Njala (Kori), Kenema (Nongowa). *Phyllosticta* sp., possibly *P. Cucurbitacearum* Sacc. Tabe (Kowa), 22.9.35, M 841.

**Cynometra leonensis Hutch. & J. M. Dalz.**

On trunk : *Trametes Meyenii* Kl. Probably on this host, Sumbuya (Lubu), 8.11.31, M 366.

**Cyperus Zollingeri Steud.**

On inflorescence : *Cintractia peribebuyensis* Speg. Kichom (Samu), 6.1.28, M 172.

**Daucus Carota Linn.,** Carrot.

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 8.1.31, M 337C.

**Deinbollia pinnata Schum. & Thonn.**

On leaves : *Cercospora* sp. Njala (Kori), 18.3.33, M 448 ; Newton (Colony), 28.6.35, M 742.

**Delonix regia Raf. (Poinciana regia Boj.), Flamboyante.**

On trunk : *Theissenia pyrenocrata* (Theiss. ?) Maubl. Hill Station (Colony), 2.4.27, M 130.

**Desmodium linearifolium G. Don.**

On leaves : *Parodiella perisporioides* (Berk. & Curt.) Speg. Kissy (Colony), 14.11.34, M 670.

**Dianthus chinensis Linn. var. Heddewigii Regel.**

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Hill Station (Colony), March 1935.

**Digitaria longiflora Pers.**

On inflorescence : *Ustilago Rabenhorstiana* Kuehn. Tombo (Mambolo), 7.1.28, M 171.

**Digitaria seminuda Stapf.**

On inflorescence : *Ephelis japonica* P. Henn. Njala (Kori), 23.7.27, M 161.

**Dioscorea cayennensis Linn., Yellow Yam.**

Mosaic (virus).

**Dioscorea esculenta Burkill, Chinese Yam.**

On leaves and tubers : *Sclerotium* sp. *S. Rolfsii* group. Leaf spot, Njala (Kori), 1.12.28, M 232 ; Makump (Mapaki), 2.10.28, M 232A.

**Dioscorea hirtiflora Benth.**

On leaves : *Cercospora* sp. Njala (Kori), 18.10.28, M 240.

**Dioscorea praehensilis Benth., Wild Yam.**

On stems : *Bagnisiopsis Dioscoreae* Wakef. Njala (Kori), 18.10.28, M 636.

**Dioscorea rotundata Poir., White Yam.**

On stems, and rarely on petioles and larger veins of leaves : *Bagnisiopsis Dioscoreae* Wakef. Njala (Kori), September 1928, M 200. Also at Makump (Mapaki) and Newton (Colony).

**Dioscorea sp. (FCD 2872), Wild Yam.**

On stems : *Bagnisiopsis Dioscoreae* Wakef. Njala (Kori), March 1933, M 637.

**Dioscoreophyllum tenerum Engl.**

On leaves : *Cercospora* sp. Njala (Kori), 20.10.33, M 504.

***Dodonaea viscosa* Linn.**

On leaves : *Cercospora* sp. Njala (Kori), 10.1.31, M 324.

***Dolichos biflorus* Linn.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), January 1932, M 629.

***Dolichos Lablab* Linn.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

***Dracaena Smithii* Baker.**

On leaves : *Colletotrichum gloeosporioides* Penz. Njala (Kori), 7.3.34, M 612.

***Elaeis guineensis* Jacq., Oil Palm.**

Juvenile or Crown disease (? physiological).

On leaves and seedlings : *Pestalozzia palmarum* Cooke.

On leaves of young palms : *Corticium Solani* (Prill. & Del.) Bourd. & Galz., probably. On " Deli " palms. Njala (Kori), 13.2.32, M 378.

On fruit : *Botryodiplodia Theobromae* Pat. Njala (Kori), 1.3.34, M 614E. *Glomerella cingulata* (Stonem.) Spauld & von Schrenk. Njala (Kori), 1.3.34, M 614A. *Hypomyces Ipomoeae* (Halst.) Wollenw. Njala (Kori), 1.3.34, M 614D.

***Elephantopus spicatus* Aubl.**

On leaves : *Oidium* sp. Hill Station (Colony), 30.5.35, M 723.

***Erythrina senegalensis* DC.**

On leaves : *Meliola bicornis* Wint. Bonthe, 26.3.32, M 384.

***Eulophia cristata* Steud.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

***Euphorbia hirta* Linn.**

On leaves : *Oidium* sp. Newton (Colony), 27.6.35, M 734.

***Fimbristylis dichotoma* Vahl.**

On leaves : *Puccinia Fimbristylidis* Arth. Njala (Kori), 24.9.26, M 31.

On inflorescence : *Cintractia axicola* (Berk.) Cornu. Njala (Kori), 24.9.26, M 31.

***Gaillardia aristata* Pursh.**

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Newton (Colony), June 1935.



**Gerbera Jamesoni Bolus.**

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Gliricidia maculata H.B.K.**

On leaves : *Meliola bicornis* Wint. Njala (Kori), 8.3.32, M 383.

**Gossypium spp., Cotton.**

Leaf Curl (virus). On " Kwande " (*G. hirsutum* Linn.) in mosaic form. Bedu (Kisi Tungi), 1925, Jones. Leaf Roll (physiological). On " Allen " and rarely on " Kwande ", 1925, Jones.

On leaves and stems : *Bacterium Malvacearum* E. F. Sm. Common.

On leaves : *Cerotelium desmium* (Berk. & Br.) Arth. Njala (Kori), 1924 ; on *G. hirsutum*, Batkanu (Gombahun), 16.1.34, M 569 ; on *G. peruvianum*, Njala (Kori), 31.12.35, M 941A ; on *G. hirsutum*, Njala (Kori), 31.12.35, M 941B.

**Gynura cernua Benth.**

On leaves : *Cercospora* sp. Newton (Colony), 14.2.35, M 709.

**Hedychium coronarium Koenig.**

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Helianthus tuberosus Linn., Jerusalem Artichoke.**

On leaves, stems and tubers : *Sclerotium* sp. of *S. Rolfsii* group Njala (Kori).

**Hevea brasiliensis Muell. Arg., Para Rubber.**

On trunk : *Ustilina zonata* Lév. Kenema (Nongowa), 15.11.26, M 51.

On twigs : *Cephaleuros mycoidea* Karst. Njala (Kori), 1925, Dunlap.

**Hibiscus esculentus Linn., Okra.**

On leaves : *Irenopsis Mælleriana* (Wint.) Stev. Njala (Kori), 14.11.33, M 498. *Oidium* sp. Njala (Kori), 14.11.33, M 499.

**Hibiscus Sabdariffa Linn.**

On leaves : *Aecidium Garckeanum* P. Henn. Newton (Colony), 2.8.35, M 783. *Irenopsis Mælleriana* (Wint.) Stev. Njala (Kori), 19.11.30, M 320 ; Tiama (Kori), 26.12.33, M 550.

**Hibiscus Scottellii Bak.f.**

On leaves : *Irenopsis Mælleriana* (Wint.) Stev. Yoni (Sitia), 10.11.31, M 359.

**Hibiscus surattensis Linn.**

On leaves and calyx : *Aecidium Garckeanum* P. Henn. Njala (Kori), 5.12.28, M 220.

**Hippeastrum equestre** (Ait.) Herb., Red "Lily".

On leaves and bulbs: *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Holarrhena africana** A. DC.

On leaves: *Meliola simillima* Ell. & Ev. Njala (Kori), 27.1.33, M 425; 2.4.33, 425B.

**Hydrangea opuloides** Koch.

On leaves: *Cercospora canescens* Ell. & Mart. Njala (Kori), 7.12.34, M 665. *Colletotrichum* sp. Njala (Kori), 7.12.34, M 665A.

**Hymenocardia Heudelotii** Muell. Arg.

On leaves: *Cercospora* sp. Njala (Kori), 12.2.34, M 607.

**Hyptis brevipes** Poit.

On leaves: *Cercospora* sp. Njala (Kori), 3.11.33, M 605.

**Impatiens Balsamina** Linn., Garden Balsam.

On leaves: *Oidium* sp. Hill Station (Colony), 30.5.35, M 712. Common. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Impatiens sultani** Hook. f. (Garden hybrids).

On leaves: *Myrothecium* sp., probably *M. roridum* Tode. Njala (Kori), 4.10.33, M 484.

**Imperata cylindrica** Beauv. var. **Koenigii** Dur. & Schinz, Lalang Grass.

On leaves: *Puccinia rufipes* Diet. Njala (Kori), 15.6.27, M 152.

**Indigofera** sp.

Mosaic (virus). Tabe (Kowa), 1935.

**Ipomoea Batatas** Poir., Sweet Potato.

On leaves: *Phyllosticta Batatae* Thuem. Boltum (Turtle Is.), 15.11.31, M 360; Njala (Kori), 24.7.35, M 772.

On roots: *Monilochaetes infuscans* (Ell. & Halst.) Harter. Njala (Kori), 19.12.29, M 298.

**Ipomoea cairica** Sweet.

On leaves: *Meliola clavulata* Wint. Rokupr (Samu), 29.1.35, M 697.

**Ipomoea digitata** Linn.

On leaves: *Puccinia Batatae* Syd. Njala (Kori), 12.1.27, M 126; 25.5.27, M 147; June 1927, M 162.

On leaves and stems: *Cystopus Ipomoeae-panduratae* (Schw.) Stev. & Swing. Njala (Kori), 25.6.27, M 151.

***Ipomoea involucrata* P. Beauv.**

On leaves : *Cercospora Batatae* Zimm. Njala (Kori), 14.11.33, M 503.

***Ipomoea Learii* Lindl.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), December 1933, M 631. *Meliola clavulata* Wint. Njala (Kori), 5.12.32, M 408.

***Ipomoea purpurea* Lam. (*Convolvulus major* Hort.).**

On leaves : *Cercospora Ipomoeae* Wint. Njala (Kori), 6.1.34, M 574.

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

***Ipomoea setifera* Poir.**

On leaves : *Cercospora Batatae* Zimm. Rokupr (Samu), 27.1.35, M 688. *Meliola clavulata* Wint. Rokupr (Samu), 27.1.35, M 689.

***Ixora coccinea* Linn.**

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

***Ixora lutea* Hutch.**

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

***Jacquemontia pentantha* (Jacq.) G. Don.**

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

On leaves, stems and flowers : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

***Jasminum pauciflorum* Benth.**

On leaves : *Aecidium jasminicola* P. Henn. Njala (Kori), 12.3.34, M 654 and 19.5.34, M 654A ; Hill Station (Colony), 25.5.35, M 717.

***Jasminum pubescens* Willd.**

On leaves and, more rarely, on stems : *Sclerotium coffeicola* Stahel. Njala (Kori), August 1933, M 468.

***Jatropha podagrica* Hook.**

On blossoms : *Botrytis cinerea* Pers. Njala (Kori), 25.12.32, M 419B.

***Lactuca sativa* Linn., Lettuce.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

***Lagenaria vulgaris* Linn., Calabash.**

On leaves : *Cercospora Cucurbitae* Ell. & Ev. Near Njala (Kori), 24.1.29, M 246. *Oidium* sp. Njala(Kori).

**Leptoderris fasciculatus Dunn.**

On leaves : *Cymatella* sp. Njala (Kori), 11.2.35, M 702 ; Hill Station (Colony), 25.5.35, M 718 ; Newton (Colony), 26.6.35, M 739. *Meliola bicornis* Winter. Njala (Kori), 3.12.33, M 512 ; Newton (Colony), 26.6.35, M 737.

**Lochnera rosea Reichb., Periwinkle.**

Rosette disease (probably virus). Njala (Kori), 1931.

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 24.6.31, M 626.

**Lonchocarpus cyanescens Benth.**

On leaves : *Meliola bicornis* Winter. Njala (Kori), 29.12.33, M 548.

**Luffa acutangula Roxb.**

On leaves : *Myrothecium roridum* Tode. Tabe (Kowa), 22.9.35, M 842.

**Luffa cylindrica Roem., Loofa.**

On leaves : *Cercospora Cucurbitae* Ell. & Ev. Njala (Kori), 19.10.31, M 357B ; Robat (Samu), 6.8.35, M 789. *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori), 19.10.31, M 357A.

**Lycopersicum esculentum Mill., Tomato.**

On leaves : *Cercospora* sp., apparently *C. canescens* Ell. & Mart. Njala (Kori), 12.2.34, M 606. *Cladosporium fulvum* Cooke. Njala (Kori), 6.1.34, M 586. Also at Kenema (Nongowa).

In stems : *Bacterium Solanacearum* E.F.Sm., probably. Njala (Kori), Kenema (Nongowa) and apparently fairly widespread.

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

On fruit : Blossom-end rot (physiological).

**Mangifera indica Linn., Mango.**

On leaves, twigs, blossoms and fruit : *Gloeosporium Mangiferae* P. Henn. Njala (Kori), 7.3.29, M 647 ; 21.4.34, M 647A. Also in Colony.

On leaves : *Coniothyrium* sp. Njala (Kori), 16.11.32, M 404.

**Manihot Glaziovii Muell. Arg., Ceara Rubber.**

Mosaic (virus). Cline Town and Wilberforce (Colony).

On leaves : *Cercospora Henningsii* Allesch. Rokupr (Samu), 28.1.35, M 691. Apparently rare.

**Manihot utilissima Pohl, Cassava.**

Mosaic (virus). Common in Southern Province and Colony, and in Western chiefdoms of Northern Province.

On leaves : *Cercospora Henningsii* Allesch. Njala (Kori), 11.10.33, M 486. Widespread and common. *Ragnhildiana Manihotis* Stev. & Solh. Njala (Kori), 11.10.33, M 487. Widespread and common.

On stems : *Gloeosporium Manihotis* P. Henn. Njala (Kori), 7.9.31, M 474.

On roots, in store : *Sphaerostilbe repens* Berk. & Br. Njala (Kori).

**Mariscus umbellatus Vahl.**

On inflorescence : *Cintractia limitata* Clint. Njala (Kori), 23.5.27, M 144 ; Newton (Colony), 26.6.35, M 745.

**Melochia melissifolia Benth.**

On leaves : *Cercospora* sp. Njala (Kori), 9.7.35, M 756A ; Robat (Samu), 6.8.35, M 756B.

**Microglossa volubilis DC.**

On leaves : *Irenina cyclopoda* Stev. Njala (Kori), 23.1.34, M 556.

**Millettia rhodantha Baill.**

On leaves : *Uromyces* sp. Njala (Kori), 17.12.34, M 671.

**Mirabilis Jalapa Linn., Marvel of Peru.**

On leaves and stem : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Mucuna aterrima Holland, Bengal Bean.**

On leaves : *Cercospora Stizolobii* Syd. Njala (Kori), 1.12.28, M 236 ; Newton (Colony), 3.8.35, M 779A. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 1.12.33, M 630. *Meliola bicornis* Winter. Njala (Kori), 1.12.28, M 223.

**Mucuna pruriens DC.**

On leaves : *Cercospora Stizolobii* Syd. Robat (Samu), 6.8.35, M 779B.

**Mucuna urens DC.**

On leaves : *Uromyces illotus* Arth. & Holw. Njala (Kori), 13.12.29, M 301.

**Musa Cavendishii Lambert, Canary Banana.**

On leaves : *Helminthosporium torulosum* (Syd.) Ashby. Widespread. *Rhinotrichum* sp. Njala (Kori), 13.10.33, M 489. Common. Also at Batkanu (Gombahun) and Newton (Colony). *Scolecotrichum Musae* Zimm. (*Cordana musae* (Zimm.) von Hoehn.) Widespread.

On pseudostems : *Marasmius stenophyllus* Mont. Makump (Mapaki), Njala (Kori), Freetown (Colony).

In pseudostems : *Bacterium Solanacearum* E.F.Sm., probably. Wilt. Newton (Colony), 1935.

On fruit : *Gloeosporium Musarum* Cooke & Mass. Njala (Kori). *Helminthosporium torulosum* (Syd.) Ashby. Njala (Kori), Newton (Colony). *Stachylidium Theobromae* Turc. Njala (Kori), and near Freetown (Colony).

**Musa paradisiaca** Linn., Plantain.

On leaves : *Rhinotrichum* sp. Njala (Kori).

On pseudostems : *Marasmius stenophyllus* Mont. Makump (Mapaki).

**Musa sapientum** Linn., Banana.

On leaves : *Helminthosporium torulosum* (Syd.) Ashby. Widespread *Rhinotrichum* sp. Njala (Kori). *Scolecotrichum Musae* Zimm. (*Cordana musae* (Zimm.) von Hoehn.) Njala (Kori), 24.1.29, M 250. Widespread.

On pseudostems : *Fusarium oxysporum* Schlecht var. *cubense* (E.F.Sm.) Wollenw. & Reink. Widespread. On all varieties. Isolated from " Pseudo-Lacatan ", Njala (Kori), 1929. *Marasmius stenophyllus* Mont. Makump (Mapaki), 3.2.30, M 309.

**Nerium Oleander** Linn., Oleander.

On blossoms : *Botrytis cinerea* Pers. Njala (Kori), 9.1.34, M 591.

**Nicotiana rustica** Linn., Tobacco.

On leaves : *Cercospora Nicotianae* Ell. & Ev. Kabala (Warawara Yagala), December 1932, M 420A.

**Nicotiana Tabacum** Linn., Tobacco.

On leaves : *Cercospora Nicotianae* Ell. & Ev. Near Njala (Kori), 3.1.33, M 420B.

**Ocimum viride** Willd.

On leaves : *Meliola microspora* Pat. & Gaill. Near Njala (Kori) 24.1.29, M 247.

**Oplismenus hirtellus** Beauv.

On small buds in leaf axils : *Epichloe Oplismeni* P. Henn. Njala (Kori), 18.7.27, M 155.

**Oryza glaberrima** Steud., Rice.

On glumes : *Helminthosporium Oryzae* van Breda. Njala (Kori), 7.12.33, M 622. Apparently very rare.

**Oryza sativa** Linn., Rice.

On leaves : *Piricularia Oryzae* Bri. & Cav. Rokupr (Samu), June 1935, M 761A ; July 1935, M 761B. also at Makump (Mapaki) and Njala (Kori).

On leaves and glumes : *Helminthosporium Oryzae* van Breda. Njala (Kori), 2.10.28, M 227. Common everywhere. *Nigrospora Oryzae* (Berk. & Br.) Petch. Njala (Kori), August 1935, M 761C.

On grain : *Ustilaginoidea virens* (Cooke) Tak. Shenge (Kagboro), 18.9.29, M 294A ; Njala (Kori), 20.9.29, M 294B ; also at Mano (Dasse), 1933, and Mopele (Kagboro), 1930.

**Ostryoderris leucobotrya** Dunn.

On leaves : *Meliola bicornis* Winter. Njala (Kori), 4.12.33, M 518 ; Newton (Colony), 26.6.35, M 736.

**Panicum maximum** Jacq., Guinea Grass.

On leaves : *Cercospora fusimaculans* Atk. Njala (Kori), 9.9.33, M 465.

**Parinari excelsa** Sabine, Rough-skinned Plum.

On trunk : *Fomes pachyphloeus* Pat. Near Gene (Soro), 26.11.26, M 86. *Ganoderma lucidum* (Leyss.) Karst. Njala (Kori), 18.5.27, M141.

**Parkia bicolor** A. Chev.

On trunk : *Fomes pachyphloeus* Pat. Near Mabonto (Simiria), 1928.

**Paspalum scrobiculatum** Linn.

On leaves : *Myriogenospora Paspali* Atk. Njala (Kori), 5.12.29, M 293. *Phyllachora sphaerosperma* Winter Hill Station (Colony), 30.12.26, M 134. *Puccinia* sp., probably *P. substriata* Ell. & Barth. Njala (Kori), 24.9.26, M 32.

On inflorescence : *Ephelis japonica* P. Henn. Njala (Kori), 8.8.27, M 163.

On grains : *Sphacelia* sp. Njala (Kori), 30.10.33, M 510.

**Paullinia pinnata** Linn.

On leaves : *Meliola Paullinae* Stevens. Njala (Kori), 23.3.29, M 260.

**Pavetta nitida** Hutch. & J. M. Dalz.

On leaves : *Aecidium flavidum* Berk. & Br. Hill Station (Colony), December 1926, M 133 and 29.5.35, M 720.

**Pennisetum leonis** Stapf & C. E. Hubbard.

On inflorescence : *Sclerospora graminicola* (Sacc.) Schroet. Njala (Kori), 25.11.29, M 286 ; November 1933, M 542.

On grains : *Sphacelia* sp. Njala (Kori), 7.12.29, M 287. *Ustilago Penniseti* (Kunze) Rabenh. Njala (Kori), December 1926, M 122. Also at Kambia (Magbema) and Rokupr (Samu).

On leaves : *Puccinia Penniseti* Zimm. Njala (Kori), 27.11.35, M 916.

**Pennisetum polystachyon** Schult.

On leaves : *Phyllachora sphaerosperma* Winter (*Sphaerodothis sphaerosperma* (Wint). Stev. & Moore). Hill Station (Colony), 5.10.26, M 35 ; Newton (Colony), 3.8.35, M 781C.

**Pennisetum subangustum** (Schum.) Stapf & C.E. Hubbard.

On leaves : *Phyllachora sphaerosperma* Winter. Freetown (Colony), 13.10.26, M 34. *Puccinia* sp. Njala (Kori), 3.12.29, M 292.

**Persea gratissima** Gaertn. f., Avocado.

On blossoms : *Botrytis cinerea* Pers. Njala (Kori), 25.12.32, M 419.

On seedling : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

On fruit : *Colletotrichum gloeosporioides* Penz. Njala (Kori).

**Petroselinum hortense Hoffm., Parsley.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 15.8.30, M 337F.

**Petunia hybrida Vilm.**

On leaves : *Cercospora canescens* Ell. & Mart. Hill Station (Colony), 21.5.35, M 716.

**Phaseolus aconitifolius Jacq.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 25.8.31, M 354D.

**Phaseolus coccineus Linn., Scarlet Runner Bean.**

On stems of seedlings : *Macrophomina Phaseoli* (Maubl.) Ashby. Njala (Kori), April, 1935, M 749.

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Phaseolus lunatus Linn.**

Mosaic (virus).

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori). *Sclerotium* sp. of *S. Rolfsii* group. Makene (Bombali Sebur).

**Phaseolus vulgaris Linn., Dwarf French Bean.**

Mosaic (virus).

On leaves : *Cercospora canescens* Ell. & Mart. Njala (Kori), 5.12.29, M 295. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori). Also on stems and pods.

On stems : *Macrophomina Phaseoli* (Maubl.) Ashby. Njala (Kori), 2.3.34, M 611B ; Hill Station (Colony), 26.3.35, M 707. *Pythium* sp. near *P. myriotylum* Drechsl. Wilt of seedlings. Njala (Kori), October 1935. *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori)

On pods : *Alternaria macrospora* Zimm. Njala (Kori), February 1932, M 377. *Cercospora canescens* Ell. & Mart. Njala (Kori), February 1932, M 377. *Helminthosporium gigasporum* Berk. & Br. subsp. *javanicum* Penz. & Sacc. Njala (Kori), February 1932, M 377.

**Phialodiscus unijugatus Radlk.**

On leaves : *Meliola* ? *capensis* (Kalchlr. & Cooke) Theiss. var. Njala (Kori), January 1932, M 361.

**Phlox Drummondii Hook.**

On leaves : *Oidium* sp. Hill Station (Colony), 21.5.35, M 714.

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Newton (Colony) ; Hill Station (Colony).

**Phyllanthus discoideus Muell. Arg.**

On leaves : *Aecidium* ? *Phyllanthi* P. Henn. Makene (Bombali



Sebura), 15.1.34, M 567 ; Rokupr (Samu), 29.1.35, M 693 ; Njala (Kori), 31.12.35, M 942. *Cercospora* sp. Njala (Kori), 4.11.33, M 501.

***Physalis angulata* Linn.**

On leaves : *Cercospora physalicola* Ell. & Barth. Njala (Kori), 25.7.35, M 752.

***Physalis peruviana* Linn., Cape Gooseberry.**

Leaf Crinkle (virus), probably the same as on *Capsicum*. Njala (Kori), 1928.

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), December 1933, M 634.

***Pilea muscosa* Lindl.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori). *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

***Piper umbellatum* Linn.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

***Plumeria rubra* Linn., Frangipani.**

On leaves : *Irenina* ? *escharoides* (H. Syd.) Stev. Njala (Kori), 3.12.33, M 513.

***Porana paniculata* Roxb.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), December 1933, M 633.

***Pouzolzia guineensis* Benth.**

On leaves : *Cercospora* sp. Njala, 20.10.33, M 502.

***Psidium Guajava* Linn., Guava.**

On roots : ? *Armillaria mellea* (Vahl.) Fr. Makump (Mapaki), 1929

***Pteridium aquilinum* Kuhn.**

On leaves : *Uredinopsis macrosperma* Magn. Njala (Kori), 2.12.34, M 662.

***Pterocarpus santalinoides* L'Hér.**

On leaves : *Meliola bicornis* Wint. Njala (Kori), 12.2.32, M 374.

***Pueraria phaseoloides* Benth.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

***Randia maculata* DC.**

On leaves : *Meliola Psychotriae* Earle. Njala (Kori), 22.2.33, M 434.

**Rauwolfia vomitoria Afz.**

On leaves : *Meliola simillima* Ell. & Ev. Njala (Kori), 21.3.33, M 444 ; Rokupr (Samu), 29.1.35, M 704. *Cercospora* sp. Njala (Kori), 2.2.34, M 605 ; Newton (Colony), 2.8.35, M 786.

**Rhynchospora corymbosa Britton.**

On inflorescence : *Cintractia leucoderma* (Berk.) P. Henn. Near Gegbwema (Tunkia), 17.11.26, M 64 ; Mambolo (Mambolo), 5.1.28, M 170 ; Njala (Kori), 24.12.30, M 334. *Cintractia* sp. Njala (Kori), 16.6.33, M 462.

**Ricinus communis Linn.,** Castor-oil.

On leaves : *Cercosporina ricinella* (Sacc. & Berl.) Speg. Newton (Colony), 16.11.34, M 658. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 1.9.26, M 28.

**Rinorea liberica Engl.**

On leaves : *Myrothecium roridum* Tode. Njala (Kori), 2.2.34, M 604.

**Rosa spp.** Rose.

On leaves : *Diplocarpon Rosae* (Lib.) Wolf. Freetown (Colony), 6.11.26, M 39. Common at Njala (Kori) and elsewhere. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Rottboellia exaltata Linn.**

On leaves : *Uredo Rottboelliae* Diet. Njala (Kori), 4.1.30, M 305.

On inflorescence : *Ustilago flagellata* Syd. Njala (Kori), 22.11.28, M 272.

**Sabal glabra (Mill.) Sarg.**

On leaves : *Fusarium sambucinum* Fuck. form 6 Wr. (*F. discolor* var *sulphureum* (Sch.) App. & Wr.). Njala (Kori), 20.9.33, M 475.

**Saccharum officinarum Linn.,** Sugar Cane.

On leaves : *Leptosphaeria Sacchari* van Breda. Gloucester (Colony), 6.8.26, M 3. Common everywhere.

**Saccharum spontaneum Linn. var. aegyptiacum Hack.**

On leaves : *Septoriella philippinensis* Sacc. Rokupr (Samu), 29.1.35, M 700.

**Salvia coccinea Linn.**

On leaves and stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Salvia farinacea Benth.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), December 1931, M 628.

***Sanchezia nobilis* Hook. f.**

On leaves: *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

***Scytopetalum Tieghemii* Hutch. & J. M. Dalz.**

On leaves: *Cercospora* sp. Njala (Kori), 3.12.28, M 237.

***Sesamum orientale* Linn., Beni.**

On leaves: *Cercospora Sesami* A. Zimm. Njala (Kori), 2.10.33, M 464A.

***Sesamum radiatum* Schum.**

Mosaic (virus).

On leaves: *Cercospora Sesami* A. Zimm. Njala (Kori), 14.7.33, M 464.

***Sida carpinifolia* Linn. f.**

Mosaic and leaf curl. Probably virus.

***Sida linifolia* Cav.**

On leaves: *Irenopsis Moelleriana* (Wint.) Stev. Njala (Kori), 4.10.28, M 208.

***Sida urens* Linn.**

Mosaic (virus).

On leaves: *Puccinia heterospora* Berk. & Curt. Njala (Kori), 20.11.28, M 221 ; Jama (Kowa), 22.9.35, M 822.

***Solanum duplosinuatum* Klotzsch.**

On leaves: *Piricularia* sp. Njala (Kori), 26.12.33, M 587.

***Solanum Melongena* Linn., Egg-plant.**

On leaves: *Aecidium tubulosum* Pat. & Gaill. forma *africana* P. Henn. Njala (Kori), 1.4.32, M 390 ; Masanki (Kolifa Mabang), 26.4.32, M 390A. *Cercospora Melongenae* Well. Njala (Kori), 17.12.28, M 239. *Piricularia* sp. Njala (Kori), 23.11.33, M 522.

On stem: *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

On fruit: *Colletotrichum Capsici* (Syd) Butl. & Bisby. Njala (Kori), 25.12.33, M 590. *Gloeosporium Melongenae* Sacc. Njala (Kori), 25.12.33, M 590. *Phyllosticta hortorum* Speg. ? Near Njala (Kori), February 1934, M 613.

***Sorghum gambicum* Snowden var. *celsum* Snowden, Guinea Corn.**

On grains: *Sphacelotheca Sorghi* (Link) Clinton. Makump (Mapaki), December 1928, M 218, one record ; now presumed completely eliminated.

On heads: *Curvularia lunata* (Wakker) Boedijn. *Cercospora Sorghi* Ell. & Ev. *Clasterosporium Maydicum* Sacc. *Phoma insidiosa* Tassi. Above records from Makump (Mapaki), 11.12.29, M 297.

On leaves: *Helminthosporium turcicum* Passer. Njala (Kori), 25.7.35, M 753.

**Sorghum margaritiferum Stapf** var. **margaritiferum Snowden**, Guinea Corn.

In grains : *Sphacelotheca Sorghi* (Link) Clinton. Kabala (Warawara Yagala), 17.11.30, M 316 (only record).

On heads : *Curvularia lunata* (Wakker) Boedijn. *Fusarium herbarum* (Corda) Fr. *Clasterosporium Maydicum* Sacc Above records from Kambia (Magbema), 28.12.27, M 176.

On leaves : *Cercospora Sorghi* Ell. & Ev. Njala (Kori), 7.11.29, M 296. *Helminthosporium turcicum* Passer. Njala (Kori), 6.9.33, M 467.

**Spigelia Anthelmia Linn.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 17.6.35, M 724. Also at Newton (Colony). *Oidium* sp. Njala (Kori), 28.1.34, M 602.

**Sterculia Tragacantha Lindl.**

On leaves and stems of seedling : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Newton (Colony), 29.6.35, M 754.

**Streptogyne gerontogaea Hook. f.**

On inflorescence : *Balansia* sp. cf. *B. Andropogonis* Syd. Gorahun (Tunkia), 23.11.26, M 80.

**Tagetes erecta Linn.**, African Marigold.

On leaves : *Cercospora tagetica* Ell. & Ev. Njala (Kori), 31.10.35, M 875.

On flower heads : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori). *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Tamarindus indica Linn.**, Tamarind.

On leaves : *Exosporium Tamarindi* H. Syd. Njala (Kori), 10.2.33, M 432A.

**Telanthra Bettzickiana Regel**, Ornamental "Alternanthera".

On stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori); Newton (Colony). *Macrophomina Phaseoli* (Maubl.) Ashby. Njala (Kori), 12.1.35, M 683; Newton (Colony), 9.6.35, M 721.

**Theobroma Cacao Linn.**, Cacao.

On twigs : *Botryodiplodia Theobromae* Pat Common, in marshy situations etc. *Corticium salmonicolor* Berk. & Br. Limba (Bagbor), September 1928, M 196; Gandohun (Malen), Wukoia (Bari), and Makump (Mapaki), October 1928. *Marasmius scandens* Mass. White thread. Makump (Mapaki), 23.8.28, M 185; and elsewhere. Common. *Marasmius* sp. cf. *M. equicrinis* Muell. Horse-hair blight. Wukoia (Bari), 12.4.29, M 279B; and elsewhere. Frequent.

On trunk : *Armillaria mellea* (Vahl) Fr. Collar crack. Makump (Mapaki), 1929. *Phytophthora palmivora* Butl. Canker. Frequent.

On pods : *Botryodiplodia Theobromae* Pat. Brown pod rot. Common. *Phytophthora palmivora* Butl. Black pod rot. Frequent.

**Thevetia neriifolia** Juss.

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 28.11.30, M 337A.

On fruit : *Colletotrichum* sp. Njala (Kori).

**Thunbergia fragrans** Roxb.

On leaves : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Tigridia Pavonia** Ker.

On leaves and stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Trichosanthes Anguina** Linn., Snake Gourd.

On leaves and stem : *Cercospora Cucurbitae* Ell. & Ev. Newton (Colony), 3.8.35, M 780. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Newton (Colony). *Myrothecium roridum* Tode. Newton (Colony), 3.8.35, M 780B ; Njala (Kori), 17.9.35, M 849A. *Phyllosticta* sp. probably *P. Cucurbitacearum* Sacc. Njala (Kori), 17.9.35, M 849B.

**Trimezia martinicensis** Herb.

On leaves and stems : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Urena lobata** Linn.

On leaves : *Irenopsis Moelleriana* (Wint.) Stev. Njala (Kori), 14.11.33, M 490 ; Newton (Colony), 27.6.35, M 738.

**Vicia Faba** Linn., Broad Bean.

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 27.8.31, M 627.

**Vigna unguiculata** (Linn.) Walp., Cow Pea.

Mosaic (virus).

On leaves and pods : *Cercospora canescens* Ell. & Mart. Makump (Mapaki), 8.2.29, M 258 ; also at Njala (Kori) and elsewhere. Common

On leaves and stems ; *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

On stems : *Macrophomina Phaseoli* (Maubl.) Ashby. Njala (Kori), 2.3.34, M 611A. *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Vigna** sp. near *V. racemosa* Hutch. & J. M. Dalz. (FCD 2953).

Mosaic. Probably virus.

**Vitex cuneata Thom.**

On leaves : *Meliola rizalensis* H. & P. Syd. Batkanu (Gombahun) 15.1.34, M 564 ; Tabe (Kowa), 21.9.35, M 828.

**Vitex micrantha Guerke.**

On leaves : *Meliola rizalensis* H. & P. Syd. Njala (Kori), 19.2.34, M 615.

**Vitis vinifera Linn., Grape.**

On leaves : *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni. Njala (Kori), 9.10.32, M 418.

**Voandzela subterranea Thouars, Bambara Groundnut.**

On leaves and stems : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Waltheria lanceolata R. Br.**

Mosaic. Probably virus.

On stems and leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori).

**Xanthosoma sagittifolium Schott, Tannier.**

On leaf stalks : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

**Xylopia aethiopica A. Rich.**

On leaves : *Aecidium* sp. Nyeyama (Peri), 14.4.29, M 263. *Cercospora* sp. Njala (Kori), 28.1.34, M 576.

**Zea Mays Linn., Maize, Indian Corn.**

On leaves : *Curvularia lunata* (Wakker) Boedijn. Mapaki (Mapaki), 24.8.28, M 203; and elsewhere. *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Moyamba (Gandima), 25.8.31, M 354. Form with small sclerotia. *Helminthosporium turcicum* Passer. Njala, 17.12.28, M 231 ; Mapaki (Mapaki), 24.8.28, M 203 ; and elsewhere. *Metasphaeria* sp. Mapaki (Mapaki), 24.8.28, M 203. *Physoderma Zeae-Maydis* Shaw. Njala (Kori), 13.7.28, M 201 ; also at Mayolo (Mapaki) and Moyamba and Levuma (Gandima).

On cobs : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), 30.6.31, M 346. Form with large sclerotia as described by Bertus (Yearbook, Dept. Agric. Ceylon, 1929, p. 44). *Diplodia macrospora* Earle. Njala (Kori), 5.12.29, M 288. *Sclerotium* sp. of *S. Rolfsii* group. Newton (Colony), 25.8.31.

On husks and old male inflorescences : *Curvularia lunata* (Wakker) Boedijn. Njala (Kori), December 1929, M 290, 291. *Cercospora Sorghi* Ell. & Ev. Njala (Kori), December 1929, M 290. *Clasterosporium Maydicum* Sacc. Njala (Kori), December 1929, M 290. *Gibberella Saubinetii* (Mont.) Sacc. Njala (Kori), December 1929, M 290.

*Leptosphaeria patellaeformis* Passer. Njala (Kori), December, 1929, M 290. *Ophiobolus heterostrophus* Drechsl. (*Helminthosporium* stage) Njala (Kori), December 1929, M 289, M 291. *Phoma insidiosa* Tassi. Njala (Kori), December 1929, M 290, M 291.

***Zephyranthes tubispatha* Herb.**

On bulbs : *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori). Also occurs on the leaves. *Sphaerostilbe repens* Berk. & Br. Njala (Kori). 11.11.35, M 871B.

***Zingiber officinalis* Roscoe, Ginger.**

On leaves : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori), September 1926, M 27.

***Zinnia elegans* Jacq.**

In stem : *Bacterium Solanacearum* E.F.Sm., probably. Wilt. Newton (Colony).

On leaves and flowers : *Oidium* sp. Hill Station (Colony), 30.5.35, M 713, common ; Newton (Colony), 3.8.35, M 713A.

On flower heads : *Corticium Solani* (Prill. & Del.) Bourd. & Galz. Njala (Kori). *Sclerotium* sp. of *S. Rolfsii* group. Njala (Kori).

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**XXIX—LIST OF FUNGI COLLECTED IN SIERRA LEONE.**  
F. C. DEIGHTON. (Plant Pathologist, Agricultural Department, Sierra Leone.)

The fungi in this preliminary list have been for the most part collected by the author since 1926 and identified by the staff of the Imperial Mycological Institute in co-operation with Miss. E M. Wakefield, who has named most of the larger Basidiomycetes, and with Dr. Charles Chupp, who has revised some of the records of species of *Cercospora*. Through the courtesy of the Director of the Royal Botanic Gardens, Kew, the names of eleven fungi collected by Mr. N. W. Thomas in 1914 and identified by Miss E. M. Wakefield have been included and are distinguished by this collector's name. Besides these eleven, Mr. Thomas's collection included a few others which have been collected again several times more recently and to which therefore his name has not been added in this list. The record of *Clypeolum sparsum* is taken from Kew Bulletin, 1899, 183.

In order to facilitate cross-reference with the "Preliminary List of Fungi and Diseases of Plants in Sierra Leone" published in this same number of the Bulletin, the genera of the host plants of parasitic fungi have been given, and where it seems likely that the habitat of a saprophytic species is restricted, details of this have

also been given. Entomogenous fungi, many of which were identified by Mr. T. Petch, have been distinguished by an asterisk. The arrangement of the families follows that of Clements and Shear, "The Genera of Fungi" (1931).

## MYXOMYCETES.

*Arcyria cinerea* Pers. var. *digitata* G. Lister.  
*Fuligo septica* Gmel.  
*Lycogala epidendrum* Fr. var. *exiguum* Lister.  
*Siemonitis herbatica* Peck.  
*S. splendens* Rost. (N. W. Thomas).

## PHYCOMYCETES.

### CHYTRIDIACEAE.

*Physoderma Zeae-Maydis* Shaw, on *Zea*.

### MUCORACEAE.

*Absidia Lichtheimi* (Luc. & Const.) Lendner.  
*Choanephora infundibulifera* (Curr.) Sacc., on old blossoms and leaves.  
*Rhizopus nigricans* Ehrenb.  
*Syncephalastrum cinereum* Bain.

### EMPUSACEAE.

\**Empusa apiculata* Thaxt., on flies (*Ochromyia* sp. and *Paralimna adversa*).  
\**E. Fresenii* Nowak, on *Aphis laburni* on Groundnut.  
\*? *E. Grylli* (Fresen.) Nowak, on termites.  
\*? *Entomophthora Aphisidis* Hoffm., on *Aphis medicaginis* on *Gliricidia*.

### PERONOSPORACEAE.

*Cystopus Ipomoeae-panduratae* (Schw.) Stev. & Swing., on *Ipomoea*.  
*Phytophthora palmivora* Butl., on *Theobroma*.  
*P. parasitica* Dast. emend. Ashby, on *Citrus* and *Carica*.  
*Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni, on *Vitis*.  
*Pythium* sp. near *P. myriotylum* Drechsl., on *Phaseolus*.  
*Sclerospora graminicola* (Sacc.) Schroet., on *Pennisetum*.

## ASCOMYCETES.

### SACCHAROMYCETACEAE.

*Saccharomycodes Ludwigii* Hansen, on *Citrus*.

### ERYSIPHACEAE.

*Oidium* sp. on *Albizzia*, *Carica*, *Cissus*, *Crotalaria*, *Cucumis*, *Cucurbita*, *Elephantopus*, *Euphorbia*, *Hibiscus*, *Impatiens*, *Lagenaria*, *Phlox*, *Spigelia* and *Zinnia*.



## PERISPORIACEAE.

- Irenina cyclopoda* Stev., on *Microglossa*.  
*I. ? escharoides* (H. Syd.) Stev., on *Plumeria*.  
*I. glabra* (Berk. & Curt.) Stev., on *Coffea*.  
*I. sepulta* (Pat.) Stev., on *Avicennia*.  
*Irenopsis guaianensis* (Stev. & Dowell) Stev., on *Cola*.  
*I. Moelleriana* (Wint.) Stev., on *Hibiscus*, *Sida* and *Urena*.  
*Meliola bicornis* Wint., on *Azelia*, *Albizzia*, *Erythrina*, *Gliricidai*,  
*Leptoderris*, *Lonchocarpus*, *Ostryoderris*, *Pterocarpus* and  
*Stizolobium*.  
*M. ? capensis* (Kalchbr. & Cooke) Theiss. var., on *Phialodiscus*.  
*M. clavulata* Wint., on *Ipomoea*.  
*M. microspora* Pat. & Gaill., on *Ocimum*.  
*M. Paullinae* Stev., on *Paullinia*.  
*M. Psychotriae* Earle, on *Randia*.  
*M. rizalensis* H. & P. Syd., on *Vitex*.  
*M. simillima* Ell. & Ev., on *Holarrhena* and *Rauwolfia*.  
*Parodiella perisporioides* (Berk. & Curt.) Speg., on *Crotalaria* and  
*Desmodium*.

## SPHAERIACEAE.

- Ceratosphaeria lampadophora* (Berk. & Br.) Niessl.  
*Ceratostomella paradoxa* Dade.  
*Daldinia angolensis* (Welw. & Curr.) Sacc., on dead twig of  
*Ceiba pentandra*.  
*D. Eschscholtzii* (Ehrenb.) Rehm.  
*Eutypella citricola* Syd., on dead twig of *Citrus aurantifolia*.  
*Glomerella cingulata* (Stonem.) Spauld. & von Schrenk, on  
*Capsicum*, *Carica* and *Elaeis*.  
*Hypomyces Ipomoeae* (Halst.) Wollenw., on *Citrus* and *Elaeis*.  
*Hypoxyton anthrochroum* Berk. & Br.  
*H. haematostroma* Mont.  
*Leptosphaeria patellaeformis* Passer, on *Zea*.  
*L. Sacchari* van Breda, on *Saccharum*.  
*Metasphaeria* sp., on *Zea*.  
*Ophiobolus heterostrophus* Drechsl., (conidial stage), on *Zea*.  
*Peroneutypella pusilla* Syd., on *Citrus*.  
*Thamnomycetes Chamissonis* Ehrenb., (N. W. Thomas).  
*Theissenia pyrenocrata* (Theiss. ? ) Maubl., on *Delonix*.  
*Ustilina zonata* Lév., on *Hevea*.  
*Xylaria grammica* Mont., (N. W. Thomas).  
*X. haemorrhoidalis* Berk. & Br.  
*X. plebeja* Ces.

## HYPOCREACEAE.

- Balansia* sp. cf. *B. Andropogonis* Syd., on *Streptogyne*.  
\**Cordyceps Lloydii* Fawc., conidial stage (*Hymenostilbe for micarum*)  
on an ant.

- \**C. tuberculata* (Leb.) Maire (*C. Sphingum* (Schw.) Sacc.), on noctuid and pyralid moths.  
*Epichloe Oplismeni* P. Henn., on *Oplismenus*.  
*Gibberella Saubinetii* (Mont.) Sacc., on *Zea*.
- \**Hypocrella Reineckiana* P. Henn., on *Pulvinaria* sp. on *Anisophyllea laurina* and *Psidium Guajava*, and on *Saissetia nigra* on *Plumeria*.
- \**H. sphaeroidea* Syd. (*H. olivacea* Petch), *Aschersonia* stage, on lecaniid scale insect on *Phoenix dactylifera*.  
*Megalonectria pseudotrichia* Speg. (*Stilbum cinnabarinum* Mont.)  
*Neocosmospora vasinfecta* E. F. Smith, on *Canavalia*.
- \**Podonectria coccicola* (Ell. & Ev.) Petch (= *Tetracium coccicolum* von Höhnelt), on *Dinaspis annae* and *Lepidosaphes* sp. on *Citrus*.  
*Sarcoxydon aurantiacum* Pat.  
*Sphaerostilbe repens* Berk. & Br., on *Carica*, *Manihot* and *Zephyranthes*.  
*Ustilaginoides virens* (Cooke) Tak., on *Oryza*.

#### DOTHIDEACEAE.

- Bagnisiopsis Dioscoreae* Wakef., on *Dioscorea*.  
*Myriogenospora Paspali* Atk., on *Paspalum*.  
*Phyllachora sphaerosperma* Wint. on *Pennisetum* and *Paspalum*.

#### MYRIANGIACEAE.

- \**Myriangium* sp., probably *M. Duriaei* Mont. & Berk., on mussel scale of *Citrus*.

#### POLYSTOMELLACEAE.

- Diplocarpon Rosae* (Lib.) Wolf, on *Rosa*.

#### MICROPELTACEAE.

- Clypeolum sparsum* Mass., on leaves of undetermined host (? Euphorbiaceae). (K.B., 1899).

#### DERMATEACEAE.

- Tryblidiella rufula* (Spreng.) Sacc. var. *microspora* Ell. & Ev.

#### PEZIZACEAE.

- Cookeina sulcipes* (Berk.) Kuntze.

### BASIDIOMYCETES.

#### PUCCINIACEAE.

- Aecidium Blepharidis* Har. & Pat., on *Blepharis*.  
*A. bomolense* Syd., on *Adenia*.  
*A. flavidum* Berk. & Br., on *Pavetta*.  
*A. Garckeanum* P. Henn., on *Hibiscus*.  
*A. jasminicola* P. Henn., on *Jasminum*.

*A. ? Phyllanthi* P. Henn., on *Phyllanthus*.  
*A. tubulosum* Pat. & Gaill. forma *africana* Henn., on *Solanum*.  
*Aecidium* sp., on *Xylopia*.  
*Cerotelium desmium* (Berk. & Br.) Arth., on *Gossypium*.  
*Hemileia Scholzii* Syd., on *Clerodendron*.  
*Puccinia Andropogonis* Schw., on *Andropogon*.  
*P. Batatae* Syd., on *Ipomoea*.  
*P. Fimbristylidis* Arth., on *Fimbristylis*.  
*P. heterospora* Berk. & Curt., on *Sida*.  
*P. lateritia* Berk. & Curt. on *Borreria*.  
*P. Penniseti* Zimm., on *Pennisetum*.  
*P. rufipes* Diet., on *Imperata*.  
*P. ? substriata* Ell. & Barth., on *Paspalum*.  
*Puccinia* sp., on *Pennisetum*.  
*Puccinosira Anthocleistae* P. Henn., on *Anthocleista*.  
*? Mimema* sp., on *Cassia*.  
*Uredinopsis macrosperma* Magn., on *Pteridium*.  
*Uredo Cajani* Syd., on *Cajanus*.  
*U. Rottboelliae* Diet., on *Rottboellia*.  
*Uredo* sp., on *Milletia*.  
*Uromyces illotus* Arth. & Holw., on *Mucuna*.  
*U. leptodermus* Syd., on *Brachiaria*.

#### USTILAGINACEAE.

*Cintractia axicola* (Berk.) Cornu, on *Fimbristylis*.  
*C. leucoderma* (Berk.) P. Henn., on *Rhynchospora*.  
*C. limitata* Clint., on *Mariscus*.  
*C. peribebuyensis* Speg., on *Cyperus*.  
*Cintractia* sp., on *Rhynchospora*.  
*Sphacelotheca Sorghi* (Link) Clinton, on *Sorghum*.  
*Ustilago Penniseti* (Kunze) Rabenh., on *Pennisetum*.  
*U. Rabenhorstiana* Kuehn, on *Digitaria*.  
*U. flagellata* Syd., on *Chasmopodium* and *Rottboellia*.

#### AURICULARIACEAE.

*Hirneola Auricula-Judae* Fr.  
*Septobasidium* sp., on *Citrus*.

#### DACRYOMYCETACEAE.

*Guepinia spathularia* (Schw.) Fr. (N. W. Thomas).

#### THELEPHORACEAE.

*Corticium salmonicolor* Berk. & Br., on *Theobroma*.  
*C. Solani* (Prill. & Del.) Bourd. & Galz. (*Rhizoctonia Solani* Kuehn), on numerous hosts, mainly cultivated plants.  
*Corticium* spp. (*Sclerotium Rolfsii* group), on numerous hosts, mainly cultivated plants.  
*Stereum elegans* Fr. (N. W. Thomas).  
*S. umbrinum* Berk. and Curt.

## POLYPORACEAE.

- Amauroderma rugosum* (Nees) Bres.  
*Fomes hornodermus* (Mont.) Cooke.  
*F. noxius* Corner, on *Cola*.  
*F. lignosus* (Kl.) Bres.  
*F. pachyphloeus* Pat., on *Parinari* and *Parkia*.  
*F. yucatanensis* (Murr.) Sacc. & D. Sacc., on *Cathormion*.  
*Ganoderma applanatum* (Pers.) Pat. var. *philippinense* Humphr.  
*G. Colossus* (Fr.) Bres. (*N. W. Thomas*)  
*G. lucidum* (Leyss.) Karst. on *Parinari*; common saprophyte.  
*G. mastoporum* (Lév.) Pat. (*N. W. Thomas*).  
*Hexagonia discopoda* Pat.  
*H. Dybowskii* Pat.  
*H. hirta* Pal.  
*H. Miquelii* (Mont.) Sacc.  
*Lenzites Palisoti* Fr.  
*Polyporus arcularius* (Batsch) Fr. (*N. W. Thomas*).  
*P. durus* Jungh.  
*P. gilvus* (Schw.) Fr.  
*P. grammocephalus* Berk. var. *favoloides* P. Henn.  
*P. ostreiformis* Berk.  
*P. pyrophilus* Wakef., on burnt tree stump.  
*Polystictus funalis* Fr.  
*P. Hunteri* Lloyd.  
*P. incomptus* Fr.  
*P. licnoides* (Mont.) Fr.  
*P. Mollerianus* Sacc., Berl. & Roum.  
*P. occidentalis* (Kl.) Fr.  
*P. sanguineus* (Linn.) Fr.  
*P. tabacinus* (Mont.) Fr.  
*P. xanthopus* Fr.  
*Polystictus* sp., possibly a form of *P. obovatus* (Jungh.). (*N. W. Thomas*).  
*Poria Ravenalae* (Berk. & Br.) Sacc., on leaf base of *Elaeis guineensis*.  
*Trametes corrugata* (Pers.) Bres.  
*T. incerta* Currey.  
*T. Meyenii* Kl., on a leguminous tree probably *Cynometra leonensis*.

## AGARICACEAE.

- Armillaria mellea* (Vahl) Fr. on *Theobroma* and probably on *Psidium*.  
*Coprinus atramentarius* (Bull.) Fr., common on shrivelled oil palm fruit bunches on the tree.  
*C. plicatilis* (Curt.) Fr.  
*Cymatella* sp., on *Leptoderris*.  
*Lentinus villosus* Kl. (*N. W. Thomas*).  
*L. Tuber-regium* Fr.

*Marasmius* sp. aff. *M. equicrinis* Mull., on several wild and cultivated hosts.

*M. scandens* Mass., on several wild and cultivated hosts.

*M. stenophyllus* Mont., on *Musa*.

*Psilocybe foenisecii* (Pers.) Quél.

*Schizophyllum commune* Fr.

#### LYCOPERDACEAE.

*Lycoperdon Wrightii* Berk. & Curt.

*Podaxis carcinomalis* (Linn.) Mass. (*N. W. Thomas*).

#### NIDULARIACEAE.

*Cyathus limbatus* Tul.

### FUNGI IMPERFECTI.

#### PHOMACEAE (Sphaeroidaceae).

*Botryodiplodia Theobromae* Pat., on numerous hosts.

*Coniothyrium* sp., on *Mangifera*.

*Darlucal filum* (Biv.) Cast., in uredo-sori.

*Diplodia macrospora* Earle, on *Zea*.

*D. natalensis* Pole Evans, on *Citrus*.

*Macrophomina Phaseoli* (Maubl.) Ashby, on *Brassica*, *Carica*, *Phaseolus* and *Vigna*.

*Phoma insidiosa* Tassi, on *Zea* and *Sorghum*.

*Phoma* sp., on *Carica*.

*Phyllosticta Batatae* Thuem., on *Ipomoea*.

? *P. hortorum* Speg., on *Solanum*.

*Phyllosticta* sp., probably *P. Cucurbitacearum* Sacc., on *Cucurbita*, *Cucumis* and *Trichosanthes*.

*Septoriella philippinensis* Sacc., on *Saccharum*.

#### ZYTHIACEAE (Nectrioidaceae).

\**Aschersonia crenulata* Pat. & Har., on an aleurodid on *Phyllanthus discordeus*.

\**A. hypocroidea* (Cooke & Mass.) Petch, on *Aleurodes* sp. on *Funtumia africana*, *F. elastica* and *Anisophyllea laurina*.

#### LEPTOSTROMACEAE.

*Leptothyrium Pomi* (Mont. & Fr.) Sacc., on *Citrus*.

#### DISCELLACEAE (Excipulaceae).

*Dinemasporium graminum* Lév., on old leaves of *Ananas comosus*.

*D. graminum* Lév. forma *Bambusae* Roll., on old leaves of *Vetiveria nigriflora*.

*Ephelis japonica* P. Henn., on *Digitaria* and *Paspalum*.

#### MELANCONIACEAE.

*Colletotrichum Capsici* (Syd.) Butl. & Bisby, on *Capsicum* and *Solanum*: common as a saprophyte.

*C. gloeosporioides* Penz., on *Citrus* and other hosts.  
*Gloeosporium Mangiferae* P. Henn., on *Mangifera*.  
*G. Manihotis* P. Henn., on *Manihot*.  
*G. Melongenae* Sacc., on *Solanum*.  
*G. Musarum* Cooke & Mass., on *Musa*.  
*Pestalozzia Coffeae* Zimm., on *Coffea*.  
*P. palmarum* Cooke, on *Elaeis*.  
*Phaceloma Fawcettii* Jenkins, on *Citrus*.

#### MONILIACEAE.

- \**Aspergillus candidus* Link group, doubtfully parasitic on larva of *Othreis fullonica*.
- \**A. flavus* Link group, on Locust (*Locusta migratoria migratorioides*) and on nymph of *Zonoceros variegatus*.  
*A. versicolor* (Vuill.) Tirabosch.  
*A. Wentii* Wehm. series, on *Citrus*.
- \**Beauveria Bassiana* (Bals.) Vuill, on *Nisotra uniforme*.
- \**B. densa* (Link.) Vuill., on the kola weevil (*Paremydica insperata*).  
*Botrytis cinerea* Pers., on *Citrus*, *Jatropha*, *Nerium*, *Persea*; common on blossoms.
- \**Cephalosporium Lecanii* Zimm., on *Aspidiotus destructor* on Coconut, and on *Dinaspis annae* and *Lepidosaphes* sp. on Orange.  
*Chlamydomyces palmarum* (Cooke) Mason, on decaying bud of *Cocos nucifera*.  
*Monilia sitophila* (Mont.) Sacc.  
*Oospora Citri-Aurantii* (Ferrar.) Sacc. & Syd., on *Citrus*.  
*Paecilomyces Varioti* Bainier series and *P. sp.*, on Citrus juice.  
*Penicillium citrinum* Sopp.  
*P. digitatum* Sacc., on *Citrus*.  
*P. italicum* Wehm., on *Citrus*.  
*P. luteum* Zukal group.  
*Piricularia Oryzae* Bri. & Cav., on *Oryza*.  
*Piricularia* sp., on *Solanum*.  
*Rhinotrichum* spp., on *Musa* and *Cinnamomum*.  
*Trichoderma Koeningi* Oudem., on soil.  
*T. viride* Pers. ex Fr.  
*Trichothecium roseum* Link.
- \**Verticillium cinnamomeum* Petch, on *Aspidiotus destructor*.

#### DEMATIACEAE.

- Alternaria circinans* (Berk. & Curt.) Bolle, on *Brassica*.  
*A. macrospora* Zimm., on *Phaseolus*.  
*Cercospora Batatae* Zimm., on *Ipomoea*.  
*C. Canavaliae* Syd., on *Canavalia*.  
*C. canescens* Ell. & Mart., on *Phaseolus*, *Vigna*, *Hydrangea*, and *Petunia*, and apparently this species on *Crotalaria* and *Lycopersicum*. Also on moribund tissues of several hosts.  
*Cercospora* sp. of *C. canescens* type, on *Clerodendron*.

- C. citrullina* Cooke, on *Citrullus*  
*C. coffeicola* Berk. & Cooke, on *Coffea*.  
*C. Cucurbitae* Ell. & Ev., on *Cucumis*, *Lagenaria* Luffa and *Trichosanthes*.  
*C. Duddiae* Welles, on *Allium*.  
*C. fusimaculans* Atk., on *Panicum*.  
*C. Henningsii* Allesch., on *Manihot*.  
*C. Ipomoeae* Wint., on *Ipomoea*.  
*C. Melongenae* Welles, on *Solanum*.  
*C. Nicotianae* Ell. & Ev., on *Nicotiana*.  
*C. personata* (Berk. & Curt.) Ell. & Ev., on *Arachis*.  
*C. physalicola* Ell. & Barth., on *Physalis*.  
*C. Sesami* A. Zimm., on *Sesamum*.  
*C. Sorghi* Ell. & Ev., on *Sorghum* and on male inflorescence of *Zea Mays*.  
*C. Stizolobii* Syd., on *Mucuna* and *Stizolobium*.  
*C. tageticola* Ell. & Ev. on *Tagetes*.  
*Cercospora* spp., mostly apparently undescribed, on *Anchomanes*, *Boerhaavia*, *Callichilia*, *Cardiospermum*, *Cassia*, *Cercestis*, *Chlorophora*, *Clerodendron*, *Deinbollia*, *Dioscorea*, *Dioscoreophyllum*, *Gynura*, *Hymenocardia*, *Hyptis*, *Melochia*, *Phyllanthus*, *Pouzolzia*, *Rauwolfia*, *Scytopetalum* and *Xylopia*.  
*Cercosporina ricinella* (Sacc. & Berl.) Speg., on *Ricinus*.  
*Cladosporium fulvum* Cooke, on *Lycopersicum*.  
*Clasterosporium Maydicum* Sacc., on *Zea* and *Sorghum*.  
*Curvularia lunata* (Wakker) Boedijn, on *Sorghum*, *Zea* and other hosts.  
*Helicoma* ? *velutinum* Ellis, on leaf of *Cinnamomum zeylanicum*.  
*Helminthosporium flagellatum* Yates, on sooty mould on *Cola nitida* and *Coffea liberica*.  
*H. glabroides* Stev., on *Irenina glabra* on *Coffea liberica*.  
*H. gigasporum* Berk. & Br. subsp. *javanicum* Penz. & Sacc. on *Carica* and *Phaseolus*; common saprophyte.  
*H. Oryzae* van Breda de Haan, on *Oryza*.  
*H. torulosum* (Syd.) Ashby, on *Musa*.  
*H. turcicum* Passer, on *Zea* and *Sorghum*.  
*Helminthosporium* sp. near *H. Helleri* Stev., on *Irenina glabra* on *Coffea liberica*.  
*Monilochaetes infuscans* (Ell. & Halst.) Harter, on *Ipomoea*.  
*Nigrospora Oryzae* (Berk. & Br.) Petch, on *Oryza* and other hosts.  
*Periconia pycnospora* Fres., on fruit of *Bauhinia acuminata*, and possibly this species especially common on dead leaves of *Manihot utilissima*.  
*Pseudocampytom fasciculatum* (Cooke & Mass.) Mason.  
*Ragnhildiana Manihotis* Stev. & Solh., on *Manihot*.  
*Scolecotrichum Musae* Zimm., on *Musa*.  
*Stachylidium Theobromae* Turc., on *Musa*.

## STILBACEAE.

- \**Gibellula araneorum* (Schw.) Syd., on spiders and a nymph of homopterous bug on *Merremia dissecta*.
- \**Hirsutella citriformis* Speare, on a reduviid bug and on a wasp. *Stilbum* ? *nanum* Mass., on *Cajanus*.
- \**Synnematium Jonesii* Speare (probably), on *Basilides bipennis* and another membracid, and on *Alcides dentipes*.

## TUBERCULARIACEAE.

- Exosporium Tamarindi* H. Syd., on *Tamarindus*.
- Fusarium herbarum* (Corda) Fr., on *Sorghum*.
- F. moniliforme* Sheld., and var. *subglutinans* Wollenw. & Reink., on *Citrus*.
- F. oxysporum* Schlecht., on *Ageratum* and *Citrus*.
- F. oxysporum* Schlecht., var. *cubense* (E. F. Sm.) Wollenw. & Reink., on *Musa*.
- F. sambucinum* Fuck. form 6 Wr. (*F. discolor* var. *sulphureum* (Schl.) App. & Wollenw.), on *Sabal*.
- F. sambucinum* Fuck. forma, on *Cocos*.
- F. semitectum* Berk. & Rav. var. *major* Wollenw. (*F. incarnatum* (Röb.) Sacc.), on *Cordyline*.
- F. theobromae* App. & Strunk., on *Citrus*.
- \* *Microcera aurantiicola* Petch or *M. coccophila* Desm., on mussel scale of *Citrus*.
- Myrothecium* sp., probably *M. roridum* Tode, on *Impatiens*, *Luffa*, *Rinorea* and *Trichosanthes*.
- Papularia Arundinis* (Corda) Fr.
- \* *Pseudomicrocera Henningsii* (Koord.) Petch var. *longispora* Petch (*Calonectria diploa* (Berk. & Curt.) Wollenw), on *Aspidiotus destructor* on Coconut, on scale insects on Orange and Cape Gooseberry, and on *Aspidiotus* sp. on Avocado.
- Spegazzinia ornata* Sacc.
- Sphacelia* spp., on *Pennisetum* and *Paspalum*.

## STERILE MYCELIA.

- Rhizoctonia Solani* Kuehn. See *Corticium Solani*.
- Sclerotium coffeicola* Stahel, on *Jasminum*.
- S. Rolfsii* Sacc. group. See *Corticium* spp.

## PSEUDOSACCHAROMYCETES.

- Mycotorula* sp. (? or *Candida* sp.), in Citrus fruits and in Citrus juice.

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## XL—A NOTE ON THE HIMALAYAN DAPHNES. B. L. BURTT.

Sir Joseph Hooker himself suggested that the name *Daphne cannabina* Wall. of the Flora of British India (14)\* covered more than one species, and W. W. Smith and G. H. Cave (17) have since

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\* The numbers in parentheses refer to the bibliography at the end of the paper.



shown that this is so. The nomenclature of the plants concerned, however, has never been brought into conformity with the International Rules, and it therefore seems desirable to review the whole question.

Confusion in both classification and nomenclature dates from the first reference to these plants. In 1818 Wallich read a paper to the Asiatic Society in which he described the paper-shrub of Nepal under the name "*Daphne cannabina* Lour.?", and this was published with a good figure and dissections in 1820 (2). Two varieties were recorded by Wallich in his "Observation," one with pure white, the other with reddish flowers, and the flowers were said to be fragrant. We can now say that Wallich's plate represents the plant with rather short reddish flowers and acute leaves found in Nepal and the eastern Himalayas (*D. cannabina* Wall. sensu W. W. Smith et Cave), whereas the white-flowered form, which has obtuse leaves and scentless flowers, is the western Himalayan plant (*D. papyracea* Decne. sensu W. W. Smith et Cave). Wallich's description combines the characters of both species: it is unfortunate that he should have written "Flores... albi, fragrantissimi," as a *Daphne* with fragrant white flowers does not seem to be known from Nepal. Wallich called attention to the fact that his plants differed from Loureiro's description of *D. cannabina* (1) in certain particulars, especially in having alternate, not opposite, leaves. True *D. cannabina* Lour. is now generally identified as *Wikstroemia indica* Linn. (21).

Later writers adopted the name *D. cannabina* Wall. (non Lour.) as though it had been a new species proposed by Wallich, and not merely a misidentification. This course was justified, according to the lax views on nomenclature then held, since the true *D. cannabina* Lour. had been reduced to *Wikstroemia indica* Linn. It is now recognised that misidentifications have no status in scientific botanical nomenclature, and a Recommendation was adopted at the Sixth International Botanical Congress, Amsterdam (1935), that they should not be cited in synonymy but be included in notes appended to the synonymy or to the description.

David Don (3) distinguished two species now placed in the section *Daphnanthès* subsection *Daphnanthoides* (Gilg) Keissler, to which "*D. cannabina* Wall." belongs. The first he identified with *D. odora* Thunb., but it is not that species, which is a native of Japan. Don's *D. odora* may be recognized from the description of the ovate acute perianth lobes and the note "flores virescenti-albi odoratissimi," as the white-flowered western Himalayan plant. It seems probable that Don identified *D. cannabina* Lour. sec. Wall. as his *D. odora* on account of Wallich's description of the flowers as white, and that the statement as to scent was copied by him from Wallich.

For the second species Don adopted Hamilton's manuscript name *Daphne Bholua*; this is identifiable with the eastern reddish-flowered plant. Don said his *D. odora* differed from *D. Bholua* in

having the perianth tube sericeous only at the base, and this is often found to be the case, though the character is not constant. *Daphne Bholua* Hamilt. ex D. Don is thus the earliest valid name for the eastern Himalayan plant with reddish flowers.

The entry in Wallich's "Catalogue" (4) is :—

1045. *Daphne cannabina* Lour. ?—Herb. 1824.

1. *Napalia* 1820.

2. Kamoon R.B.

*β latifolia* Wall. an distincta spec. ?

Pundua, F. De Silva

The Nepal plant is *D. Bholua* ; Robert Blinkworth's Kamoon [Kumaon] specimen is the western plant with white flowers ; while *β latifolia* is an Assam plant closely allied to *D. sureil* W. W. Smith et Cave.

Don's recognition of two species was not generally accepted, probably owing in part to his confusion of the western plant with *D. odora* Thunb. Thus Royle (5) wrote of *D. cannabina* "this Mr. Don thinks does not differ from *D. odora* Thunb. and of which his own, *D. Bholua*, appears to be only a variety."

In 1840 Steudel (6) proposed the name *D. papyracea* Wall. for *D. cannabina* Lour. sec. Wall., non Lour. This was simply a new name for the plants misidentified by Wallich, and accordingly covered both the white and the reddish-flowered plants. Steudel accepted *D. Bholua* Ham. ex D. Don as an independent species.

In the following year Meisner (7) gave a description covering both species, under the name *D. papyracea* Wall., and retained Wallich's variety *latifolia*. No mention is made of Don's work and there is no indication that Meisner suspected that more than one species was involved. In 1844 Decaisne (8) figured the western species as *D. papyracea* Wall. and referred to Meisner and Steudel as well as quoting *D. cannabina* Wall. (non Lour.) as a synonym. In fact, although he figured and described only the western form, there is no indication that he realised that two species were passing under this name or that he intended to restrict the name to the western species. The name *D. papyracea* Wall. sensu lato was accepted by Walpers (9), Meisner (11), Brandis (12) and Gamble (13) ; Meisner added a var. *parvifolia* from Bhutan and Khasia and considered *D. Bholua* "species obscura." Griffith (10) referred his Assam plant to *D. cannabina* Wall., but it is actually equivalent to Wallich's variety *latifolia* (*Daphne* sp. near *D. sureil* W. W. Smith et Cave).

In 1886, however, Hooker (14), who suspected that more than one species was involved, reverted to the name *D. cannabina* Wall., non Lour., remarking "Finding no authority for Steudel having attributed the name of *D. papyracea* to Wallich, I have taken for it that of *D. cannabina* which Wallich did give it, though under the erroneous impression that it was Loureiro's plant of that name."

This was naturally followed by a general return to the name *D. cannabina* (Gamble, 13a, 13b ; Brandis, 16). Keissler (15)

recognized three varieties, in addition to the type, under the names  $\beta$  *latifolia* Meisn.,  $\gamma$  *parvifolia* Meisn.,  $\delta$  *Bholua* (Don) Keissler. The first two had been described by Meisner as varieties of *D. papyracea* and should therefore be cited as var. *latifolia* (Meisn.) Keissler and var. *parvifolia* (Meisn.) Keissler.

In 1913 Smith and Cave published "A note on the Himalayan species of *Daphne*" (17) in which they recognized the eastern reddish-flowered and the western white-flowered plants as distinct species under the names *D. cannabina* Wall. and *D. papyracea* Decne. respectively. They also recognized an alpine variety of *D. cannabina*, var. *glacialis*, and a new species, *D. sureil*, found at lower levels than *D. Bholua* (*D. cannabina* Wall. sensu Smith et Cave) and distinguished by having longer white flowers and acute perianth lobes. This species differs from the western Himalayan plant in having acuminate leaves and caducous bracts.

Smith and Cave's classification has been generally accepted, and the names used by them have also been adopted by recent writers (Parker, 19, 19a; Osmaston, 20). It is shown above, however, that the name "*D. cannabina* Wall." adopted by Smith and Cave must be rejected as being a mere misidentification, and that the earliest valid name for the reddish-flowered eastern plant is *D. Bholua* Ham. ex D. Don. The question now arises what name should be borne by the white-flowered western plant. The name *D. papyracea* taken up by Smith and Cave, was published by Steudel (6) as a substitute for "*D. cannabina* Wall." which covered both species. Is it legitimate to restrict it to the white-flowered western one? The publication of *Daphne papyracea* Wall. ex Steud. was validated by the reference to Wallich's description under the name "*Daphne cannabina* Lour.?" If it could be shown that that description applied mainly to one species, then the name *D. papyracea* Wall. ex Steud. would have to be assigned to that species, whether as an accepted name or as a synonym. Actually, however, as indicated above, the description applies almost equally to both plants, though the plate represents only the reddish-flowered one. The "Regulations for determining types" provided for in the International Rules, ed. 3, have not yet been prepared, and the case must accordingly be considered on its own merits, having regard to the general principles underlying the International Rules.

Smith and Cave considered that the plant on which Wallich based his description and figure of *Daphne cannabina* was the reddish-flowered eastern one, although they recognized that the description might include both plants. They accordingly retained the name "*Daphne cannabina* Wall." for the eastern plant. They applied "*Daphne papyracea* Decne." to the white-flowered western plant on the ground that that was the one figured by Decaisne under that name. Their action in retaining the misidentification "*Daphne cannabina* Wall.", being contrary to the Rules, cannot be upheld, and their choice of a lectotype for that misapplied name consequently falls to the ground. On the other hand, the name *Daphne papyracea*

Wall. ex Steud., as has been shown, was validly published, and Smith and Cave's restriction of it to the western plant must accordingly be taken into account.

Among the principles on which the Rules are based is "the avoidance of all useless creation of names" (Art. 4). The selection by Smith and Cave of the white-flowered western species as typifying the name *Daphne papyracea* Wall. ex Steud. in effect avoided the creation of a new name for that species, and in the absence of cogent reasons to the contrary, their decision should be upheld.

Apart from this consideration, there would have been a good case for the choice of the red-flowered eastern species as lectotype, since this was the only one figured by Wallich.

It may be pointed out that much of the confusion which has arisen in the nomenclature of the two species concerned is due to the practice formerly current of citing misidentifications as if they were validly published names. The citation "*Daphne cannabina* Wall." is highly misleading. Wallich proposed no new species bearing that name: he tentatively identified certain Himalayan plants with *Daphne cannabina* Lour. Had he considered that they represented a new species, he would have given them a new specific name. Indeed it appears that he either previously or subsequently suggested the new name *D. papyracea* in manuscript, since Steudel attributed it to him.

The name *D. Bholua* Ham. ex D. Don is accordingly retained here for the eastern species, and *D. papyracea* Wall. ex Steud. for the western one.

Although it is now recommended that misidentifications should not be cited in the synonymy, it seems desirable to include the various uses of the name "*Daphne cannabina* Wall." as it was employed virtually as a later homonym.

Finally it must be pointed out that Rehder (18) identified a number of Chinese specimens as *D. papyracea* Decne., using that name to include *D. Bholua* and *D. papyracea* sensu stricto. While it has not been possible to make a detailed investigation of these plants, there seems little doubt that they do not belong to the Himalayan species.

I am greatly indebted to Dr. T. A. Sprague for help with the nomenclature of these plants, and he has added some notes on the principles involved.

***Daphne Bholua* Ham. ex D. Don, Prodr. Fl. Nepal. 68 (1825).**

*D. cannabina* Lour. ? sec. Wall. in Asiatick Researches, 13, 385 (1820), quoad tab. et descr. p.p.—non Lour. ; Numerical List n. 1045 (1829), quoad spec. nepalense.

*D. papyracea* Wall. ex Steud. Nomencl. Bot. ed. 2, 1, 483 (1840), p.p. ; Meisn. in Denkschrift. Bot. Gesellsch. Regensburg, 3, 282 (1841), p.p. ; Walp. Ann. Bot. Syst. 1, 582 (1848-49), p.p. ; Meisn. in DC. Prodr. 14, 537 (1858), p.p. ; Brandis, For. Fl. N.W. and Central India, 386 (1874), p.p. ; Gamble, Man. Ind. Timb. 315 (1881), p.p.

"*D. cannabina* Wall." sec. Hook. fil. Fl. Brit. Ind. 5, 193 (1886), p.p.; Keissler in Engl. Bot. Jahrb. 25, 93 (1898), p.p.; Gamble Man. Ind. Timb. ed. 2, 577 (1902), p.p.; Brandis, Indian trees, 544 (1906), p.p.; W. W. Smith et Cave in Rec. Bot. Surv. India, 6, 54 (1913).

*D. cannabina* var. *Bholua* (Ham. ex D. Don) Keissler in Engl. Bot. Jahrb. 25, 93 (1898).

*Frutex* 1.5–2.6 m. altus (ex Smith et Cave), ramis primum breviter hispidis demum glabrescentibus cortice plerumque brunneo papyraceo. *Folia* alterna; petiolus 5 mm. longus, supra sulcatus, vel a lamina vix distinctus; lamina anguste elliptica usque lineari-oblancoolata, 7–17 cm. longa et 1.7–2.6 cm. lata, apice acuta, rarius obtuse, acuminata vel acuta, basi angustata, marginibus integerrimis levissime revolutis interdum, praecipue folium longiorum, valde undulatis, supra nitens, subtus pallidior, utrinque glabra; costa supra impressa, subtus prominens; nervi laterales tenues, supra impressa, subtus prominuli. *Perulae* alabastri fertilis ("bracteae" auctorum aliorum) sub anthesi caducae, omnes plus minusve similes, late lanceolatae usque ad oblongo-ovatae (exterioribus brevioribus) 1.4–1.8 cm. longae, circiter 4 mm. latae, exteriores dorso glabrae, interiores appresse villosae, omnes apice pilosis et marginibus ciliatis. *Flores* circiter 7–12, capitati, in ramis terminales et ad hoc saepe in ramulis brevioribus in axillis foliorum superiorum editi, perulis circumcincti, fragrantissimi. *Pedicelli* 3–4 mm. longi, apice articulati, dense flavo-viride villosi. *Perianthium* album extra rubro-vel purpureo-suffusum (rarissime omnino album?); tubus circiter 1 cm. longus, basi leviter dilatatus, extra praecipue basin versus dense villosus, intus glaber; lobi 4, patentes, ovati, 6 mm. longi et 4 mm. lati, apice saepe leviter retusa, dorso et apice pilosa. *Stamina* 6, biseriata, omnia similia, superiora 3 mm. infra orem tubi et lobis opposita, inferiora 6 mm. infra orem tubi et lobis alterna inserta; filamenta 0.5 mm. longa, glabra; antherae 2 mm. longae. *Discus* hypogynus annularis, 0.5 mm. altus, integer, glaber. *Ovarium* brevissime stipitatum, ovoideum, 4 mm. altum, apice in stylum 0.5 mm. longum stigmate 0.5 mm. diametro papilloso coronato contractum, glabrum. *Ovulum* solitarium, pendulum. *Fructus* baccatus, niger, ovoideus, circiter 7 mm. longus et 5 mm. diametro, stigmate persistente. *Semen* solitarium, 4 mm. diametro.

INDIA. Eastern Nepal, northern Bengal, Sikkim, Bhutan and north-west Assam.

var. *glacialis* (W. W. Smith et Cave) B. L. Burtt, comb. nov.  
*D. cannabina* var. *glacialis* Smith et Cave in Rec. Bot. Surv. India, 6, 52 (1913).

*Frutex* 15–30 cm. altus, ramis atro-purpureis mox glabrescentibus, foliis deciduis, floribus cum foliis vel saepe prius nascentes.

INDIA. Sikkim; Laghep, 2850 m., May 4 1876, C. B. Clarke 27779 A.C.; Tonglo, 2700–3000 m., 1883, G. Watt 7023.

***Daphne papyracea* Wall. ex Steud. emend. W. W. Smith et Cave** in Rec. Bot. Surv. Ind. **6**, 54 (1913); Parker, For. Fl. Punjab, 432 (1918), ed. 2, 434 (1924); Osmaston, For. Fl. Kumaon, 454 (1927).

*D. cannabina* Lour. ? sec. Wall. in Asiatick Researches, **13**, 385 (1820), quoad descr. p.p., excl. tab.—non Lour.; Numerical List No. 1045 (1829), quoad spec. kumaonense.

*D. odora* Thunb. sec. D. Don, Prodr. Fl. Nepal. 68 (1825)—non Thunb.

*D. papyracea* Wall. ex Steud. Nomencl. Bot. **1**, 483 (1840), p.p.; Meisn. in Denkschrift. Bot. Gesellsch. Regensburg, **3**, 282 (1841), p.p.; Decne. in Jacquemont, Voyage dans l'Inde, **4**, Botanique 143, t. 148 (1844); Walp. Ann. Bot. Syst. **1**, 582 (1848-49), p.p.; Meisn. in DC. Prodr. **14**, 537 (1858), p.p.; Brandis, For. Fl. N.W. and Central India, 386 (1874), p.p.; Gamble, Man. Ind. Timb. 315 (1881), p.p.

"*D. cannabina* Wall." sec. Hook. fil. Fl. Brit. Ind. **5**, 193 (1886), p.p.; Keissler in Engl. Bot. Jahrb. **25**, 93 (1898), p.p.; Gamble, Man. Ind. Timb. ed. 2, 577 (1902), p.p.; Brandis, Indian Trees, 544 (1906), p.p.

*Frutex* sempervirens, superne sympodialiter ramosus, ramulis primum dense hispido-pubescentibus demum glabrescentibus, cortice cinereo-brunneo papyraceo. *Folia* alterna, breviter petiolata; petiolus plerumque 0.5–1 cm. longus vel interdum a lamina vix distinctus, supra sulcatus; lamina elliptico-oblongata vel oblanceolata, magnitudine variabilis, 6 cm. longa et 1.5 cm. lata usque ad 16 cm. longa et 3 cm. lata, apice obtusa vel obtuse acuminata, leviter retusa et pilis apicalibus albis saepe instructa, basi in petiolum sensim angustata, marginibus integerrimis leviter revolutis, supra nitens, subtus pallidior, utrinque apice excepto glabra; costa supra impressa, subtus prominens; nervi laterales utrinque circiter 6, supra venulis vix validiores et eiscum reticulo leviter impresso formantes, subtus prominuli, venulis subtus inconspicuis. *Perulae* exteriores alabastris terminalis fertilis ('bractaeae' auctorum aliorum) per anthesin persistentes, oblongae, plus minusve acuminatae, 1.3–2 cm. longae, 0.5–0.6 cm. latae, supra glabrae, extimae dorso glabrae ceterae plus minus appresse sericeo-villosae, plerumque sericeo-ciliatae et apice ipso pilis brevibus albis instructae; perulae interiores (folia redacta) ab exterioribus haud plane distinctae, circiter 1.5–2 cm. longae et 0.5 cm. latae, foliis similes sed dorso saepe appresse sericeo-villosae, post anthesin crescentes et alabastra 1–2 axillaria emittentes. *Flores* circiter 12, terminales, capitati, perulis circumcincti, inodori, pedicellati. *Pedicelli* 2 mm. longi, pilis flavo-viridibus dense sericeo-villosi. *Perianthium* album; tubus circiter 1.1 cm. longus, basi leviter dilatatus, extra (interdum basin versus tantum) appresse et molliter villosus, intus glaber; lobi 4, patentes, elliptico-oblongi, 8 mm. longi et 4 mm. lati, acuminati marginibus acuminis involutis, pilis apicalibus instructi. *Stamina* 8, biseriata, omnia similia, superiora perianthii lobis

opposita ore tubi 3 mm. distante inserta, inferiora lobis alterna et 6 mm. infra sinum inserta; filamenta glabra, 0.5 mm. longa; antherae oblongae, fere 1.5 mm. longae. *Discus* hypogynus annularis, 0.5 mm. altus, glaber. *Ovarium* stipite 1 mm. longo instructum, plus minus cylindricum, 3–4 mm. altum et fere 2 mm. diametro, apice truncatum, glabrum, uniloculare. *Stylus* crassus, 0.75 mm. longus, glaber, stigmatibus capitato 1 mm. diametro papilloso instructus. *Ovulum* solitarium, pendulum. *Fructus* baccatus, ruber, obpyriformis, usque 1 cm. longus et 0.7 cm. latus. *Semen* solitarium, pisiforme, circiter 6 mm. diametro.

INDIA. Western Punjab (around Simla), northern United Provinces and western Nepal.

After flowering and while the fruits are developing, the young axis immediately below the inflorescence usually elongates and the inner bud-scales enlarge; they never, however, attain the size of ordinary foliage leaves, but one, or more rarely 2, develop axillary buds which grow out into a new shoot, the inflorescence having terminated the growth of that from which it arose. *Daphne papyracea* has been grown in the Temperate House at Kew for many years under the name *D. cannabina*.

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#### NOTE ON TYPIFICATION.

The following considerations regarding the typification of names emerge from the examination of this case.

##### I. LECTOTYPES OF VALIDLY PUBLISHED NAMES.

###### A. *Original choice of lectotype.*

1. Where the original description clearly applies mainly to one element, that element should be taken as lectotype.

2. Where the original description covers two or more elements, and does not apply mainly to one of them, a lectotype should be chosen in such a way as to avoid any unnecessary creation of names.

3. Where the original description covers two or more elements, only one of which is figured in the original place of publication, that element should be taken as lectotype.

###### B. *Action by subsequent authors.*

4. A lectotype already chosen by a previous author should be accepted unless its choice contravened section 1.

##### II. LECTOTYPES OF MISAPPLIED NAMES.

5. Misapplications of names are not recognized under the International Rules. It follows that lectotypes of misapplied names have no status in botanical nomenclature.

T. A. SPRAGUE.

#### XLI—MISCELLANEOUS NOTES.

**The Curatorship of Kirstenbosch.**—Mr. F. W. Thorns, who left Kew in 1928, has been appointed Curator of the National Botanic Garden, Kirstenbosch, in succession to Mr. J. W. Mathews. Mr. Mathews, who is also an old Kewite, has held the post of Curator since the foundation of the Garden in 1913.

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**An Outline of Malayan Agriculture.\***—A "Handbook of Malayan Agriculture" has been in circulation for many years. In view of recent developments in Malayan agriculture, it was felt that this was out of date and it has accordingly been withdrawn from circulation and replaced by the present publication. The work has been entirely re-written and has been very ably compiled by Mr. D. H. Grist, the Economist of the Agricultural Department. Many officers of the Department and of other services, as well as the Director of the Rubber Research Institute, have, however, co-operated by furnishing information on particular subjects, while the technical publications of the Agricultural Department, and the knowledge acquired by its Field Officers, have been freely drawn upon.

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\*Compiled by D. H. Grist, Agricultural Economist, Department of Agriculture, Straits Settlements and Federated Malay States. Published by the Agricultural Department, Kuala Lumpur. 1936. Pp. xiii + 378. Illustrated by 86 plates and 2 Maps. Price \$3.



The book is divided into six parts. The first two are general and deal with the development of Malayan agriculture, land tenure, agricultural policy, co-operation, methods and systems of cultivation and soil treatment. The remaining four parts deal with the major, secondary and minor crops of the country and with livestock. In the last part there is a chapter on the farming of fresh-water fish, which, in the moist tropics, where ordinary stock farming must of necessity take a minor place, plays an important part in the domestic economy of the people.

The task of compilation can have been no light one ; for there are three distinct types of agriculture in the country and yet they are in a way interwoven and each can learn and has learnt something from the others. Firstly, there is the Malayan type, which reaches its highest development in the cultivation of rice ; otherwise this type consists mainly of perennial tree crops such as coconuts, fruit and, more recently, rubber. Secondly, there is estate agriculture, which concentrates usually on a single crop and is worked by hired labour under European direction. Finally there is the introduced Chinese agriculture, based on a highly developed practice of arable farming and which is largely confined to short-term crops which can be grown in rotation. With this system, adequate manuring is often essential and it is thus frequently supplemented with stock farming of a kind. Occasionally a single crop enters into all these types of agriculture. *Derris*, for example, is grown by the Malays as a fish poison ; it is grown and used by the Chinese market gardener as an insecticide, and is now being grown on European estates as an export crop.

H. C. SAMPSON.

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**Cloves.**—It is pleasing to record the appearance of a book\* devoted entirely to this important spice. Although much has been written in regard to the clove (*Eugenia aromatica*), existing information, as with other spices, is scattered and not readily obtainable. A good general account of the clove is contained in Ridley's " Spices " but changes in production and an increase in knowledge regarding the crop has taken place since the publication of Ridley's work. Happily the author of the book appears to have made himself thoroughly familiar with recent work on his subject and has not failed to abstract from it.

The book is divided into five sections under the headings—" The Moluccas ", " Mascarene Islands ", " Zanzibar ", " Madagascar " and " Penang ", these being the main clove producing areas of the world. The first of these occupies rather more than half the volume. This is appropriate as it is only in the Moluccas that the Clove tree occurs wild and it was there that the early trade in the

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\*" A Pageant of the Spice Islands." By R. H. Crofton. John Bale, Sons & Danielsson Ltd., London, 1936. Pp. 255 ; illustrations 5. Price 5s. net.

spice developed. The writer has paid close attention to the history of the spice trade and has obviously consulted a wide range of literature dating from early times in his search for information. References to literature are freely quoted in the text.

In turning to more modern times the author deals with production in Zanzibar, Pemba, Madagascar and Penang. Information on the growth, cultivation and yield of the tree in these countries is given. In the appendix there are useful production figures and information regarding grading in Zanzibar and Madagascar.

F. N. HOWES.

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**A Revision of *Eriogonum*.**\*—The first revision of this genus of Polygonaceae was published in 1870 by Torrey and A. Gray, who recognized 81 species (Proc. Am. Acad. 8, 146-190). Seven years later, Sereno Watson raised the number of species to 95, and supplied a revised classification. No general account of *Eriogonum* has appeared since then. Miss Stokes' study of the genus will accordingly be welcomed by all botanists who have to deal in any way with this difficult group.

The author "has classified as species any group having an identity which is maintained over a large or small area". An attempt is made to correlate the characters of subspecies and varieties with the climatic conditions under which they occur. Thus *Eriogonum vimineum* in an area with a long vegetative season is represented by the subspecies *gracile*, with "leaves alternate, not rosulate at base, long, bracts foliaceous"; with a medium vegetative season the leaves become "rosulate at base, shorter, ovate to oblong, petioles shorter, bracts reduced," as in one form of var. *Davidsonii*; while a short vegetative season is correlated with "leaves rosulate at base, round to reniform, bracts smaller, stiff, not at all foliaceous", as in another form of var. *Davidsonii* and the subspecies *molestum* and *Baileyi*.

These and numerous other "adaptations" are dealt with in the Introduction (pp. 8-11) which contains also sections on "Suspected Hybrids," "Dispersion," and "Geographical Distribution and Phylogeny." A great centre of distribution is found in eastern Oregon and southwestern Idaho. "Examined as a whole, the species of *Eriogonum* resemble an advancing and retreating wave. The wave-like movement is entirely in accord with the recent geological history of the country. The glaciers are known to have advanced into the Great Basin and to have receded."

Miss Stokes recognises 155 species of *Eriogonum*, about 40 of which are further divided into subspecies, the number of these

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\*"The genus *Eriogonum*, a preliminary study based on geographic distribution." By Susan G. Stokes. San Francisco, California. June 1, 1936 Pp. 124 + [8]. Price \$2.50, postage extra. Obtainable from Mr. J. T. Howell, California Academy of Sciences, Golden Gate Park, San Francisco.

amounting to about 200. Keys are supplied to eleven subspecies of *E. vimineum* and to the ten under *E. umbellatum*, but none is given to the fifteen subspecies of *E. effusum*.

Miss Stokes' little book is the result of many years study, and represents a courageous attempt to treat a large genus as an assemblage of living plants in their relationship with the environment, rather than as a series of bare morphological concepts.

T. A. SPRAGUE.

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**The Scientific Principles of Plant Protection.\***—In 1928 Mr. Martin broke new ground, at least in this country, with his "Scientific Principles of Plant Protection", which treated the facts of plant protection from the point of view of the chemist rather than that of the botanist or zoologist. In the eight years that have elapsed since the original edition appeared, the subject has developed greatly, largely through the investigations of the author and his colleagues at the Long Ashton Research Station. A new edition was therefore desirable, and to include the new material the book has had to be practically re-written. The title is now amplified to indicate more precisely the scope of the work. The plan of the book is similar to that of the first edition, except that the chapter on biological control now follows that on the influence of external factors on susceptibility, thus bringing together the ecological data. The amount of new literature which has been surveyed for the second edition may be judged from the fact that the number of pages of text has increased from 289 to 348 and the number of references cited from about 850 to nearly 1200.

The book is most useful both as a critical summary and as a work of reference to all those concerned with the protection of plants from fungus and insect pests. Good subject and author indexes are provided.

E. M. WAKEFIELD.

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\*"The Scientific Principles of Plant Protection, with Special Reference to Chemical Control." By Hubert Martin. London, Edward Arnold & Co., 1936. Pp. xii + 379. Price 21s. net.

# BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1936 ROYAL BOTANIC GARDENS, KEW

## XLII—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: XVI.\* E. M. MARSDEN-JONES and W. B. TURRILL.

### THE RESULTS OF FURTHER INTERSPECIFIC CROSSING.

In the present paper we describe the results obtained by crossing a stock-plant of *S. vulgaris* (B.11) with three different plants of *S. maritima* (A.2, A.5, A.15). These stock-plants have already been described: A.2, in K.B. 1928, 4 and K.B. 1933, plate 14; A.5, in K.B. 1929, 146 and K.B. 1933, plate 15; A.15 in K.B. 1929, 151, plate 7; B.11, in K.B. 1931, 121, plate 12. The crosses were made mainly for the purposes of studying the genetical behaviour of indumentum, sex, and leaf shape in interspecific crossing. No hairy varieties of wild *S. maritima* have ever been seen by us. Various statistics for the occurrence of hairy varieties in wild populations of *S. vulgaris* have been published in K.B. 1931, No. 3, and we have also a mass of unpublished data concerning many other wild populations of both species.

The following crosses and selfings were made:

N. 40. A.15  $\times$  B.11.

N. 79 = N. 40.7 selfed

N. 91 = N. 40.7 selfed

N. 92 = N. 40.4 selfed

N.100 = N. 40.3 selfed

N. 42. A.2  $\times$  B.11.

N. 93 = N. 42.13 selfed

N. 52. B.11  $\times$  A.5.

N. 83 = N. 52.1 selfed

N. 78 = N. 52.2 selfed

N. 88 = N. 52.2 selfed

In the descriptions and analyses which follow, the following points should be noted:

(1) The scoring for presence or absence of barren stems was made in the winter (15.12.1934). As explained in earlier papers of this series *S. vulgaris* is typically hemicryptophytic, the flowering shoots dying back right to ground level, while *S. maritima* is typically chamaephytic, green "barren" shoots being present all the year through. The term "intermediate" is used for plants retaining through the winter a few green barren shoots, usually situated near the base of old flowering stems.

(2) In the  $F_1$  and  $F_2$  families between B.11 and *S. maritima* the hairs are frequently much shorter than in hairy plants of British *S. vulgaris* and especially than in B.11. In scoring for indumentum

\*Continued from K.B. 1935, 219.

only the density of the hairs has been considered in this paper. There is a tendency for the hairs to be denser on the leaves than on the stems. When a difference was noted the scoring used is based on stem indumentum.

(3) In scoring for leaves the symbols M, HM, MH, H, VH, HV, V were used as in the first paper of this series (K.B. 1928, 11) except that it must be remembered that their values are constant only for families and generations involving the same stock-plants. Thus H may mean in this paper broader or narrower leaves according to the *S. maritima* parent used.

#### SELFINGS.

**N. 74.** B.11 selfed. Several selfings were made but only one plant was raised from the meagre seed obtained. This was largely due to *Marssonina* attack. The one plant closely resembled its parent. It had medium anthocyanin in the vegetative parts and a little in the calyx. The leaves were somewhat smaller. Inflorescence with up to 50 flowers. Petals lobed  $\frac{3}{4}$ ; boss; petals and segments not contiguous or overlapping. Filaments white, anthers purple. Stigmata white, immature seeds white. The only point of scored difference from the parent is the appearance of white filaments, indicating that the parent was heterozygous for this character.

**N. 14.** S.-P. 5 was selfed and produced a family of 40 plants. The family was uniform and like the parent in habit, leaves, inflorescence, calyx, corona, presence of anthocyanin blotch, filaments, stigmata, immature seeds, capsules and mature seeds. All plants produced fully developed petals and hermaphrodite flowers.

**N. 17.** S.-P. 15 was selfed and produced a family of 36 plants. The family was uniform and like the parent in habit, leaves, inflorescence, calyx, lobing of petals and overlapping of petals and segments, corona, presence of anthocyanin blotch, filaments purple, immature seeds, capsules, and mature seeds. Segregation occurred for (1) degree of anthocyanin development in vegetative parts and calyx—10 very much : 26 much, (2) stigmata colour—18 purple : 15 white, (3) sex—25 hermaphrodite : 8 female.

#### INTERSPECIFIC CROSSES.

**N. 40.** = A.15  $\times$  B.11. 30 plants in the family.

*Habit* : more or less spreading, and ascending, uniform, stems up to 5.2 dm. long, intermediate for barren shoots.

*Indumentum* : medium on stems and leaves, uniform.

*Anthocyanin in vegetative parts* : medium.

*Leaves* : varying in size on same plant and ranging from narrow lanceolate, linear-lanceolate, to linear-ob lanceolate, well developed leaves 2.8 to 3.5 cm. long and 0.5–0.8 cm. broad.

*Inflorescence* : of from 7 to 15 flowers, all slightly nodding and slightly zygomorphic.

*Calyx* : medium amount of anthocyanin ; subinflated, except No. 3, which was inflated.

*Petals* : all white ; 28 bilobed : 2 multilobed ; all lobed  $\frac{3}{4}$  ;



N 40, showing range of leaf sizes and shapes, flower parts, and portion of shoot system



6 with blotch : 24 with no blotch ; in all plants petals contiguous or overlapping and segments diverge ; 25 with  $F_1$  scales : 5 with bosses.

*Androecium* : in all anthers purple ; filaments of all purple.

*Sex* : of all plants full hermaphrodite.

*Gynoecium* : stigmata 3 plants purple : 27 plants white ; all plants had purple immature seeds.

*Mature capsules* : 26 plants (all that were scorable) had  $F_1$  capsules—except that in No. 15 the teeth fully reflexed.

*Mature seeds* : 27 plants (all that were scorable) had tubercled seeds.

**N. 79.** - N. 40·7 selfed. 9 plants in the family.

The parent (N. 40·7) had bilobed petals, with blotch,  $F_1$  scales, and white stigmata.

*Habit* : stems from 2·8 dm. to 5·5 dm. long. Nos. 5 and 8 had some lower barren shoots over-wintering, i.e., they were intermediate between the parents.

*Indumentum* : 1 dense : 4 medium : 3 glabrous.

*Anthocyanin in vegetative parts* : 1 much : 8 medium.

*Leaves* : OM : 2HM : 3MH : 1H : 1VH : OHV : OV.

*Inflorescence* : of from 7 to 15 flowers

Number of flowers 7 8 15

„ „ plants 4 1 3

Flowers all zygomorphic and nodding, even if only slightly.

*Calyx* : in all medium anthocyanin ; in all subinflated.

*Petals* : all white ; in all bilobed ; all lobed  $\frac{3}{4}$  ; 6 with : 3 without blotch ; in all petals and segments not contiguous or overlapping ; in all bosses.

*Androecium* : anthers in 4 purple ; filaments in 4 purple.

*Sex* : 1 with hermaphrodite flowers only : 3 with hermaphrodite and female flowers : 5 with female flowers only.

*Gynoecium* : stigmata of all white ; immature seeds of all purple.

*Mature capsules* : 5  $F_1$  : 3 *vulgaris* type.

*Mature seeds* : 5 tubercled : 2 armadillo.

**N. 91.** = N. 40·7 selfed. 64 plants in the family.

The parent (N. 40·7) had bilobed petals, with blotch,  $F_1$  scales, and white stigmata.

*Habit* : 24 spreading : 40 compact ; 8 prostrate : 56 ascending ; stems from 1·0 dm. up to 5·6 dm. long ; 26 barren stems fully present : 31 intermediate : 6 barren stems absent.

*Indumentum* : 24 dense : 23 medium : 3 few : 14 glabrous.

*Anthocyanin in vegetative parts* : 10 much : 48 medium : 6 little.

*Leaves* : 5M : 17HM : 21MH : 15H : 6VH : OHV : OV.

*Inflorescence* : of from 3 to 26 flowers.

Number of flowers 3|4|5|6|7|8|9|10|11|12|15|19|23

„ „ plants 1|1|3|26|1|2|3|2|1|18|1|1

Flowers all zygomorphic and nodding, even if only slightly.

*Calyx* : 2 much anthocyanin : 53 medium anthocyanin : 6 little anthocyanin ; 2 inflated : 51 subinflated : 8 narrow.



*Petals*: all white ; all bilobed except multilobed in No. 13 ; 57 lobed  $\frac{1}{2}$  : 14 lobed  $\frac{3}{4}$  ; 30 blotch present : 31 blotch absent ; petals and segments not overlapping or contiguous in 60 plants, in No. 26 petals and segments overlapping ; 3 plants  $F_1$  scales : 58 bosses.

*Androecium*: anthers 26 purple (all that were scorable) ; filaments 22 purple : 4 white.

*Sex*: 19 with hermaphrodite flowers only : 7 with hermaphrodite and female flowers : 35 with female flowers only.

*Gynoecium*: 4 plants with purple stigmata : 57 plants with white stigmata ; 57 immature seeds purple : 2 white.

*Mature capsules*: 54  $F_1$  : 3 *vulgaris* type.

*Mature seeds*: 16 armadillo : 39 tubercled.

N. 92. = N. 40.4 selfed. 91 plants in the family.

The parent (N. 40.4) had bilobed petals, with no blotch, bosses, and white stigmata.

*Habit*: 65 spreading : 26 compact ; 35 prostrate : 56 ascending ; stems from 2.2 dm. up to 6.0 dm. long ; 12 barren stems fully present : 35 intermediate : 44 barren stems absent.

*Indumentum*: 23 dense : 30 medium : 12 few : 26 glabrous.

*Anthocyanin in vegetative parts*: 11 much : 52 medium : 28 little.

*Leaves*: 5M : 45HM : 30MH : 5H : 3VH : 3HV : 0V.

*Inflorescence*: of from 5 to 29 flowers.

Number of flowers 5|6| 7|8| 9|10|11|12|13|14|15|16|17|22|23|27|28|29  
 „ „ plants 1|2|17|1|10| 3| 5| 7|13| 9|14| 2| 1| 1| 1| 1| 1| 1|

Flowers all zygomorphic and nodding, even if only slightly.

*Calyx*: 1 much anthocyanin : 34 medium anthocyanin : 51 little anthocyanin : 4 no anthocyanin ; 2 inflated : 88 subinflated.

*Petals*: all white ; 88 bilobed : 2 multilobed ; 82 lobed  $\frac{1}{2}$  : 8 lobed  $\frac{3}{4}$  ; 27 blotch present : 63 blotch absent ; petals 23 contiguous or overlapping : 67 not contiguous or overlapping ; segments 11 contiguous or overlapping : 79 not contiguous or overlapping ; 2 plants  $F_1$  scales : 88 bosses.

*Androecium*: anthers 67 purple (all in which anthers scorable) ; filaments 48 purple : 19 white.

*Sex*: 60 with hermaphrodite flowers only : 7 with hermaphrodite and female flowers : 23 with female flowers only.

*Gynoecium*: 1 with purple stigmata : 89 with white stigmata ; 78 immature seeds purple : 11 white.

*Mature capsules*: 56  $F_1$  : 19 *vulgaris* type.

*Mature seeds*: 17 armadillo : 58 tubercled.

N. 100. = N. 40.3. selfed. 12 plants in the family.

The parent (N. 40.3) had inflated calyx, bilobed petals, with no blotch,  $F_1$  scales, and white stigmata.

*Habit*: 6 spreading : 6 compact ; 2 prostrate : 10 ascending ; stems from 2.5 dm. up to 6.5 dm. long ; 3 barren stems fully present : 6 intermediate : 3 barren shoots absent.

*Indumentum*: 4 dense : 3 medium : 3 few : 2 glabrous.

*Anthocyanin in vegetative parts*: 10 medium : 2 little.

*Leaves*: 1M : 3HM : 2MH : 5H : 0VH : 1HV : 0V.

*Inflorescence*: of from 7 to 53 flowers.

Number of flowers 7|15|17|26|33|53

„ „ plants 1|7|1|1|1|1

Flowers all zygomorphic and nodding, even if only slightly.

*Calyx*: 4 medium anthocyanin : 8 little anthocyanin ; 1 inflated : 11 subinflated.

*Petals*: all white ; 10 bilobed : 2 multilobed ; all lobed  $\frac{1}{2}$  ; in all no blotch ; in all petals and segments not contiguous or overlapping ; 1 scales : 10  $F_1$  scales : 1 boss.

*Anthroecium*: anthers in 10 purple (i.e. in all hermaphrodites) ; filaments 5 purple : 5 white.

*Sex*: 9 with hermaphrodite flowers only : 1 with hermaphrodite and female flowers : 2 with female flowers only.

*Gynoecium*: stigmata of all white ; immature seeds of all purple.

*Mature capsules*: 4  $F_1$  : 2 *vulgaris* type.

*Mature seeds*: 6 tubercled (all that were scorable).

Many of the plants of this family produced very little seed.

N. 42. = A.2  $\times$  B.11. 47 plants in the family.

*Habit*: compact and ascending, uniform, stems up to 5 dm. long, intermediate for barren stems.

*Indumentum*: medium on stems and leaves, uniform.

*Anthocyanin in vegetative parts*: little.

*Leaves*: varying on same plant and ranging from lanceolate, oblanceolate, to elliptic-lanceolate, in shape tending towards the *S. vulgaris* parent, well developed leaves 2.5 to 4.2 cm. long and 0.8–1.3 cm. broad.

*Inflorescence*: of from 7 to 15 flowers, all slightly nodding and slightly zygomorphic.

*Calyx*: medium amount of anthocyanin ; inflated.

*Petals*: all white ; 39 bilobed : 8 multilobed ; all lobed  $\frac{1}{2}$  ; in all no blotch ; in all petals and segments contiguous ; all with  $F_1$  scales.

*Androecium*: in all plants scorable anthers purple ; filaments 4 purple : 7 white (hermaphrodite flowers only).

*Sex*: 1 plant with hermaphrodite flowers only : 13 with hermaphrodite and female flowers : 33 with female flowers only.

*Gynoecium*: stigmata 20 plants purple : 27 plants white. All plants had purple immature seeds.

*Mature capsules*: 16 plants (all that were scorable for capsules) had  $F_1$  capsules.

*Mature seeds*: 12 plants (all that were scorable for mature seeds) had tubercled seeds.

The female plants set fruits and seeds very sparsely or not at all.

N. 93. = N. 42.13 selfed. 54 plants in the family.

The parent (N. 42.13) had bilobed petals, pink filaments, full hermaphrodite flowers, purplish stigmata, capsules  $F_1$ , and seeds tubercled.

*Habit*: 19 spreading : 35 compact ; 32 prostrate : 22 ascending. Stems from 1.1 dm. to 5.9 dm. long. All plants uniformly had a few lower barren shoots over-wintering, but no definite chamaephytes segregated out.

*Indumentum*: 7 dense : 19 medium : 8 few : 20 glabrous.

*Anthocyanin in vegetative parts*: 19 much : 30 medium : 5 little.

*Leaves*: 2M : 15HM : 6MH : 13H : 5VH : 10HV : 3V

*Inflorescence*: of from 3 to 32 flowers.

Number of flowers 34 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 15 | 16 | 32

„ „ plants 2 | 1 | 14 | 5 | 4 | 4 | 4 | 4 | 5 | 6 | 3 | 1

All flowers showed at least a trace of zygomorphy.

*Calyx*: 3 much anthocyanin : 50 medium anthocyanin ; 17 inflated : 31 subinflated : 5 narrow.

*Petals*: all white ; 51 bilobed : 2 multilobed ; 28 lobed  $\frac{3}{4}$  : 23 lobed  $\frac{2}{3}$  : 2 lobed  $\frac{1}{2}$  ; in all no blotch ; 29 with petals overlapping or contiguous : 23 with petals not overlapping or contiguous ; 17 with segments overlapping : 35 with segments not overlapping ; 4 scales : 30 F<sub>1</sub> scales : 19 bosses.

*Androeceum*: 40 anthers purple : 3 yellow-green ; 31 filaments purple : 11 white.

*Sex*: 34 with hermaphrodite flowers only : 8 with hermaphrodite and female flowers : 11 with female flowers only.

*Gynoecium*: stigmata 43 plants purple : 8 plants white ; immature seeds 32 plants purple : 12 plants white.

*Mature capsules*: 20 F<sub>1</sub> : 12 *vulgaris* type.

*Mature seeds*: 20 tubercled : 8 armadillo.

Peculiar individual characters appeared in flowers as follows : No. 27 showed slight involution of the petals ; No. 28 had one petal quite entire in one flower ; No. 32 had two petals emarginate ; No. 37 had small *vulgaris* type of petals.

Many of the plants of this family produced very little seed.

N. 52. = B.11 × A.5. 6 plants in the family.

*Habit*: spreading and ascending, uniform, stems up to 5.5 dm. long, intermediate for barren stems.

*Indumentum*: medium on stems and leaves, uniform.

*Anthocyanin in vegetative parts*: medium.

*Leaves*: Nos. 1, 3, 4, 5, and 6 uniform, narrow-lanceolate to linear-lanceolate, 3.6 cm. long, 0.6 cm. broad, No. 2. lanceolate to linear-lanceolate, well developed leaf 4.6 cm. long, 1.2 cm. broad.

*Inflorescence*: of from 2 to 15 flowers, all slightly nodding and slightly zygomorphic.

*Calyx*: all with medium amount of anthocyanin ; all subinflated.

*Petals*: all white ; all bilobed ; all lobed  $\frac{3}{4}$  ; all with blotch ; petals and segments not contiguous or overlapping ; all with bosses.





*Androecium*: in all plants scorable, anthers purple ; filaments of 5 purple.

*Sex*: 3 with hermaphrodite flowers only : 2 with hermaphrodite and female flowers : 1 with female flowers only.

*Gynoecium*: stigmata 5 purple : 1 white ; all plants had purple immature seeds.

*Mature capsules*: in all of F<sub>1</sub> type.

*Mature seeds*: all tubercled.

**N. 83.** = N. 52.1 selfed. 18 plants in the family.

The immediate parent (N. 52.1) had narrow-lanceolate to linear-lanceolate leaves, hermaphrodite and female flowers, and white stigmata.

*Habit*: stems from 2.0 dm. to 6.7 dm. long ; 8 intermediate for over-wintering barren stems : 2 none.

*Indumentum*: 1 dense : 10 medium : 3 few : 4 glabrous.

*Anthocyanin in vegetative parts*: 4 much : 11 medium ; 3 little.

*Leaves*: 3M : 5HM : 5MH : 5H : 0VH : 0HV : 0V.

*Inflorescences* of from 3 to 23 flowers.

Number of flowers    3 7 9 15 18 23

„ „ plants        2 7 1 6 11 1

Flowers all zygomorphic and nodding, even if only slightly.

*Calyx*: 5 much anthocyanin : 11 medium : 2 little ; 2 inflated : 15 subinflated : 1 narrow.

*Petals*: all white ; in all bilobed ; 9 lobed  $\frac{3}{4}$  : 9 lobed  $\frac{2}{3}$  ; 2 with : 11 without blotch ; in all petals and segments not contiguous or overlapping ; 1 F<sub>1</sub> scales : 17 bosses.

*Androecium*: anthers and filaments purple in 3 (remainder female).

*Sex*: 3 with hermaphrodite flowers only : 15 with female flowers only.

*Gynoecium*: 14 purple : 4 white ; immature seeds 12 purple : 5 white.

*Mature capsules*: 8 F<sub>1</sub> type : 5 *vulgaris* type.

*Mature seeds*: 7 tubercled : 2 armadillo.

**N. 78.** = N. 52.2 selfed. 11 plants in the family.

The immediate parent (N. 52.2) had lanceolate to linear-lanceolate leaves, hermaphrodite flowers, and purple stigmata.

*Habit*: stems from 2.6 dm. to 5.7 dm. long ; in 7 plants barren shoots absent or very few.

*Indumentum*: 1 dense : 5 medium : 2 few : 3 glabrous.

*Anthocyanin in vegetative parts*: 9 medium : 2 little.

*Leaves*: 2M : 2HM : 6MH : 1H : 0VH : 0HV : 0V.

*Inflorescence*: of from 7 to 15 flowers.

Number of flowers 79|15

„ „ plants 71|3

Flowers all zygomorphic and nodding, even if only slightly.

*Calyx*: 5 medium anthocyanin : 6 little ; 10 subinflated : 1 narrow.

*Petals*: all white ; all bilobed ; 2 lobed  $\frac{3}{4}$  : 8 lobed  $\frac{3}{4}$  : 1 lobed  $\frac{1}{2}$  ; 3 with blotch : 8 without blotch ; all with petals and segments not contiguous or overlapping ; 1 F<sub>1</sub> scales : 2 F<sub>1</sub> scales to bosses : 1 bosses to scales : 7 bosses.

*Androecium*: anthers in 9 purple (all that were scorable) ; filaments 8 purple : 1 white (remainder not scorable).

*Sex*: 3 with hermaphrodite flowers only : 6 with hermaphrodite and female flowers : 1 with female flowers only.

*Gynoecium*: stigmata all purple ; immature seeds 7 purple : 3 white.

*Mature capsules*: 6 F<sub>1</sub> type (remainder unscorable).

*Mature seeds*: 2 tubercled : 3 armadillo (remainder unscorable).

There was high sterility in this family.

N. 88. = N. 52.2 selfed. 65 plants in the family.

The immediate parent (N. 52.2) had lanceolate to linear-lanceolate leaves, hermaphrodite flowers, and purple stigmata.

*Habit*: 33 spreading : 31 compact ; 4 prostrate : 60 ascending ; stems from 1.4 dm. up to 8.5 dm. long ; 3 barren stems fully present : 24 intermediate : 31 barren stems absent.

*Indumentum*: 6 dense : 28 medium : 9 few : 21 glabrous :

*Anthocyanin in vegetative parts*: 14 much : 36 medium : 14 little.

*Leaves*: 5M : 20HM : 12MH : 15H : 9VH : 3HV : 0V.

*Inflorescence*: of from 7 to 52 flowers.

Number of flowers 7|11|12|15|16|17|20|21|22|23|29|30|31|32|33|43|52

„ plants 7|1|2|30|1|2|2|1|2|3|1|1|6|1|1|1|1

Flowers all zygomorphic and nodding, even if only slightly.

*Calyx*: 2 much anthocyanin : 35 medium : 25 little : 1 none : 1 inflated : 58 subinflated : 4 narrow.

*Petals*: all white : all bilobed ; 12 lobed  $\frac{3}{4}$  : 30 lobed  $\frac{3}{4}$  : 17 lobed  $\frac{1}{2}$  ; 2 lobed  $\frac{1}{2}$  ; 24 with blotch : 37 without blotch ; all with petals and segments not contiguous or overlapping, except 6 with petals and 4 with segments overlapping, and unscorable in 4 plants ; 7 with F<sub>1</sub> scales : 54 with bosses.

*Androecium*: anthers in 40 purple (all that were scorable) ; filaments 36 purple : 5 white.

*Sex*: 14 with hermaphrodite flowers only : 25 with hermaphrodite and female flowers : 22 with female flowers only.

*Gynoeceium*: stigmata 42 purple : 9 white ; immature seeds 44 purple : 11 white.

*Mature capsules*: 24  $F_1$  : 6 *vulgaris* type.

*Mature seeds*: 20 tubercled : 7 armadillo.

There was a high degree of sterility in this family as shown by the incomplete setting of fruits and seeds.

#### DISCUSSION.

All the families dealt with in this paper originated from crosses between *S. vulgaris* and *S. maritima*. The characters investigated may now be considered in sequence.

*Habit*. It must be remembered that while only the one *S. vulgaris* parent (B.11) was used, three different *S. maritima* parents were used to make the three  $F_1$  families. It is obvious from the figures obtained in the  $F_2$  families that a number of factors (3 or 4 at least) are involved in giving the habit characters we have scored as spreading, compact, prostrate, and ascending. In general terms, but not necessarily in the 3 : 1 Mendelian ratio sense, ascending is dominant over prostrate. When stock-plants A.5 and A.15, were used the spreading habit was dominant over the compact, when stock-plant A.2 was used the compact habit characterized the  $F_1$  generation. The phenotypic ratios in  $F_2$  families indicate complex genic interaction and it has not been found possible to explain the dominance of the compact habit in N. 91 and N. 100.

*Barren shoots*. The scoring can be summated as follows : All  $F_1$  families were intermediate. The  $F_2$  families show that segregation occurs.

	With barren over- wintering shoots as in <i>S. maritima</i>	Intermediate	No green over- wintering shoots as in <i>S. vulgaris</i>
From N. 40	41	74	53
„ N. 52	3	32	33

These figures suggest genetical segregation modified by cytoplasmic influences ; the N. 40 families had *S. maritima* as ovule grand-parent ; the N. 52 families had *S. vulgaris* as ovule grand-parent. The N. 42  $F_2$  (N. 93) gave the unexpected result that all 52 plants showed an intermediate development of the overwintering characters, possibly due to the influence of the cytoplasm of a different *S. maritima* ovule grand-parent.

*Length of stems*. In certain families dealt with in this paper the stem lengths (longest stem per plant) were measured for every plant. The data are arranged below in two tables. The first gives the maximum, minimum, and mean in cm., and the standard deviation from the mean for five families. In the second, measurements are arranged in classes, with 10 cm. as the class range.



Family	Maximum	Minimum	Mean	S.D.
N. 91	56	10	35	10.9
N. 92	60	22	39	8.7
N.100	65	25	48	11.2
	55	10	41	
N. 93	69	11	34	11.5
N. 88	58	14	54	13.7

Family	10-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90
N. 91	6	16	22	16	4	0	0	0
N. 92	0	18	38	26	9	0	0	0
N.100	0	1	2	5	3	1	0	0
	6	35	62	47	16	1	0	0
N. 93	9	15	12	14	4	0	0	0
N. 88	1	0	9	21	12	14	5	2

It is noteworthy that the maximum and mean are higher and the standard deviation is greater in the  $F_2$  family (N. 88) with *S. vulgaris* as female (ovule) grandparent than in the  $F_2$  families with *S. maritima* as female (ovule) grandparent. The absolute minimum value shows irregularity as between the families concerned. In the frequency table the mode in N. 88 is to the right of the modes for the other families, except for the small family N. 100 with whose mode it coincides. N. 93 is slightly bimodal. These results suggest some maternal influence on stem length additional to gene segregation.

*Indumentum.* The results for  $F_2$  families may be summarized as follows :

All the  $F_1$  families were uniform for medium indumentum.

	Dense	Medium	Few	Glabrous
From N. 40	52	60	18	45
„ N. 42	7	19	8	20
„ N. 52	8	43	14	28
Totals ...	67	122	40	93

These figures together with those previously published suggest that dense : medium + few : glabrous give what is to be interpreted

as a 1 : 2 : 1 ratio. Further the ratio of medium to few is 3 : 1, suggesting the action of a modifying factor which in the homozygous condition reduces medium to few. There are also probably factors present for modifying length of hairs in such interspecific crosses as those under consideration.  $F_1$  families showed a very definite modification of the "medium" type of indumentum. Segregation for length of hairs occurred in  $F_2$  families but was so complicated that attempted scorings were considered unreliable.

**Leaves.** The following summations of  $F_2$  families give the facts :

		M	HM	MH	H	VH	HV	V
From	N. 40	11	67	56	26	10	4	0
„	N. 42	2	15	6	13	5	10	3
„	N. 52	10	27	23	21	9	3	0

It is obvious that A.2 (which was one parent of N. 42) has caused very different  $F_2$  ratios to appear from A.15 (one parent of N. 40) and A.5 (one parent of N. 52). A.2 with B.11 has given figures similar to those previously obtained when A.2 and B.1 were crossed together. It is probable that three or more factor pairs are involved.

The other two groups of families have given very similar ratios. A.15 and A.5 were both from the same Portland population and had essentially the same morphological characters, including linear leaves. Between A.15 (or A.5) and B.11 there must be at least 4 gene differences for leaf shape, since no *S. vulgaris* (B.11) foliage type appeared amongst 267  $F_2$  plants.

**Inflorescence.** The inflorescence in *Silene maritima* and *S. vulgaris* is typically a dichotomous cyme with a terminal flower to every branch. When, therefore, an inflorescence is fully developed it should have an odd number of flowers. The ideal series is 1—3—7—15—31—63—127—, any figure being obtained by multiplying the previous figure in the series by 2 and adding on 1. In the  $F_2$  families here considered modes obviously occur at 3, 7, 15, and 31. A further analysis, however, shows that a difference occurs when *S. maritima* or *S. vulgaris* is used as the ovule grandparent. This suggests that *S. maritima* cytoplasm has a retarding influence upon inflorescence branching, although there is also a complicated segregation for this character.

The following table summarizes the  $F_2$  families in which *S. maritima* and *S. vulgaris* was the maternal (ovule) grandparent respectively. If the class with 15 flowers be taken as a central class (it well represents an average  $F_1$ ) then the figures can be summarized as follows :

*maritima* as ovule grandparent, total  $F_2$  plants 234.

Less than 15 flowers 168 : 15 flowers 48 : more than 15 flowers 18 = approximately 9 : 3 : 1.

*vulgaris* as ovule grandparent, total  $F_2$  plants 92.

Less than 15 flowers 28 : 15 flowers 39 : more than 15 flowers 25 = approximately 9 : 13 : 8.

Number of flowers	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>maritima</i> ovule grand-parent	3	2	2	5	62	8	16	10	11	12	18	19	48	5	2	0
<i>vulgaris</i> ovule grand-parent	2	0	0	0	21	0	2	0	1	2	0	0	39	1	2	1

Number of flowers	19	20	21	22	23	26	27	28	29	30	31	32	33	43	52	53
<i>maritima</i> ovule grand-parent	1	0	0	1	2	1	1	1	1	0	0	1	1	0	0	0
<i>vulgaris</i> ovule grand-parent	0	2	1	2	4	0	0	0	1	1	6	1	1	1	1	1

### *Anthocyanin.*

*In vegetative parts* : the two families N. 40 and N. 52, with medium anthocyanin, gave together as the sum from their F<sub>2</sub> families

50 much : 166 medium : 53 little : 0 none.

N. 42 had little anthocyanin and gave in F<sub>2</sub>

19 much : 30 medium : 5 little : 0 none.

*In calyx* : the three F<sub>1</sub> families had all medium anthocyanin and the sum of their F<sub>2</sub> families gave 13 much : 201 medium : 98 little : 5 none. This is 312 anthocyanin : 5 no anthocyanin = 62.4 : 1.

This is surely a 63 : 1 ratio, probably based on three cumulative factors, which, however, are not necessarily of equal potentiality.

*Blotch in corolla* : N. 42 was derived from parents with anthocyanin blotch in the petals, it was uniform for and bred true to this character. In N. 40 segregation occurred in the ratio of 1 : 4. In two F<sub>2</sub> families derived from F<sub>1</sub> parents with blotches, segregation gave 2 : 1 and 1 : 1 ratios respectively. The other two F<sub>2</sub> families

had parents with no blotches; one bred true and the other segregated in a 3 : 7 ratio. In N.52 all plants had no blotch but segregation occurred in the  $F_2$  families in a (total) 3 : 5 ratio. There is no doubt that genetic factors are involved, but that the action of these depends considerably on environmental conditions.

*In anthers.* All plants bred true to purple anthers except that N. 93 threw 3 yellow-green. All  $F_1$  plants in N. 40 and N. 52 had purple filaments as had also the immediate parent of N. 93. The latter gave 31 : 11 and the  $F_2$  families from the former together gave 126 : 34 = 3.7 : 1.

*In stigmata and immature seeds.* The following table gives the breeding results :

	Stigmata			Immature seeds	
	Purple	White		Purple	White
N. 40	3	: 27	:	30	: 0
N. 79	0	: 9	:	9	: 0
N. 91	4	: 57	:	57	: 2
N. 92	1	: 89	:	78	: 11
N.100	0	: 12	:	12	: 0
N. 42	20	: 27	:	47	: 0
N. 93	43	: 8	:	32	: 12
N. 52	5	: 1	:	6	: 0
N. 83	14	: 4	:	12	: 5
N. 78	11	: 0	:	7	: 3
N. 88	42	: 9	:	44	: 11

It is evident from the above figures and from the scorings already given for N. 17 that 2 or more complementary factors and 1 or more inhibiting factors occur for colour in stigmata. All the *S. maritima* grandparents had pink immature seeds, the *S. vulgaris* grandparent had white immature seeds. In all the  $F_1$  families purple was dominant to white. The  $F_2$  families show a ratio of 251 : 44 = 5.7 : 1. It should further be noted that the  $F_2$  families derived from N.40 suggest "repulsion" between one or more factors for colour in the stigmata and one or more factors for colour in the immature seeds.

*Calyx shape.* When an *S. maritima* parent with inflated calyx was used this character was completely dominant in  $F_1$  and a fairly high percentage of inflated calyces appeared in  $F_2$ . From analyses of the figures for calyx shape at present available we are uncertain of the numbers of factors involved.

*Lobing of petals.* The family N. 52 and its selfed offspring bred true to bilobing. N. 40 and N. 42 and their selfed offspring segregated, the  $F_2$  families giving a ratio of 34.1 bilobed : 1 multilobed. It should be noted that multilobing is exceedingly rare in *S. vulgaris*. We have only found it twice in thousands of wild plants examined. In *S. maritima* it is more frequent, occurring in up to 14 per cent. of plants in some wild populations studied. The character is also very irregular in its appearance, sometimes a majority of the petals are

multilobed, more often only a small proportion on the whole plant. Bilobed and multilobed petals often occur in the same flower. Every plant showing any degree of multilobing is scored as multilobed.

All the parents and  $F_1$  families had three-quarters lobing. The  $F_2$  families summate as follows :

2 lobed  $\frac{1}{2}$  : 20 lobed  $\frac{1}{2}$  : 82 lobed  $\frac{3}{4}$  : 212 lobed  $\frac{3}{4}$ .

Petal lobing is to be more fully discussed in later papers in which further data from more extreme states will be given.

*Corona*. N. 42 had only  $F_1$  scales (small scales) and its  $F_2$  segregated for scales, bosses, and  $F_1$  scales, the last in a large majority. A. 5 and A. 15 have evidently been responsible for the relatively large preponderance of bosses in the  $F_2$  families of which they were the grandparents. The summation of the 7  $F_2$  families concerned gives 1 scales : 27  $F_1$  scales : 240 bosses.

*Sex*. The  $F_2$  families summate as follows :

From	N. 40	89♂	:	18♀ and ♀	:	65♀
„	N. 42	34♂	:	8♀ and ♀	:	11♀
„	N. 52	20♂	:	31♀ and ♀	:	38♀

It is probable that sex in *Silene maritima* and *S. vulgaris* has a genetical basis of the FM type similar to that we have postulated for *Ranunculus acris* (see Journ. Genetics 31, 363 : 1935). In *Silene*, however, we have not so far found male and neuter plants. Genetical hermaphrodites probably have the constitution FFMM and genetical females FFmm. The intermediate and fluctuating types studied have, it is suggested, the constitution FFmM, but their phenotypic expression can range from full hermaphrodite to complete female and varies with many conditions which are only very slightly understood. Hence many plants scored as hermaphrodites or females, while phenotypically belonging to these groups, may genotypically be heterozygous (presumably for M since we have found no examples of males or neuters either in the wild or in bred families). Further work is in hand to test this hypothesis.

*Mature capsules*. The  $F_1$  families all show a type of capsule intermediate between the *S. maritima* and *S. vulgaris* types.  $F_2$  families (except one small one) show segregation of *S. vulgaris* but it was not possible to separate clearly *S. maritima* from  $F_1$  type capsules and they are all scored as  $F_1$  types.

*Mature seeds*. All the original crosses involved armadillo *S. maritima* and tubercled *S. vulgaris*.  $F_1$  plants all had tubercled seeds and the  $F_2$  families show a clear 3 : 1 segregation.

## SUMMARY.

1. The results of crossing three different plants of *Silene maritima* with one plant of *S. vulgaris* are given and analyzed.

2. Two main factors and at least one modifying factor are needed to account for the indumentum types found and their genetical behaviour.

3. At least 4 gene differences are needed to account for the leaf shapes investigated.

4. The number of flowers per inflorescence is controlled by genes interacting with cytoplasmic and environmental factors. Length of stems also appears to show maternal influence additional to gene segregation.

5. Anthocyanin development is controlled by complementary and inhibiting genes which can behave independently in their action on different organs but show some linkage and "repulsion."

6. It is suggested that sex has an FM basis in which FFMM plants are full hermaphrodites, FFmm plants are females, and FFmM plants show fluctuating intersexualism.

7. Armadillo seeds are clearly recessive to tubercled.

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### XLIII—MELANESIAN PLANTS: II\*. B. L. BURTT.

**Garcinia** (Sect. **Discostigma**) **scaphopetala** B. L. Burtt [Guttiferae]; species nova *G. Warrenii* F. v. Muell. et *G. umbonatae* Lauterb. affinis, ab illa phalangibus stamineis ad petala vix adhaerentibus, ab hac floribus maioribus, sepalis subaequalibus exterioribus haud umbonatis differt.

*Arbor* glabra, circiter 10-5 m. alta, ramulis leviter angulatis. *Folia* opposita, petiolata; petiolus 5 mm. longus, supra leviter sulcatus; lamina elliptica, 11-20 cm. longa et 5-8 cm. lata, apice breviter et obtuse acuminata, basi rotundata, marginibus integris leviter revolutis; nervi laterales numerosi, leviter ascendentes, nervo intramarginali inconspicuo coniuncti. *Flores* ♂ tantum visi, in fasciculos axillares paucifloros dispositi. *Pedicelli* 5-8 mm. longi, basi vel medio vel apice bracteolis duabus instructi; bracteolae oppositae, 2 mm. longae, acutae, basi connatae. *Sepala* 4, late triangularia, 3-4 mm. longa et lata, apice obtusa. *Petala* 4, lamina suborbiculari profunde scaphiformi leviter unguiculata, 5 mm. longa et 6 mm. lata, apice rotundata. *Stamina* numerosa, in phalanges 4 ramosas petalis oppositas coniuncta. *Pistillum* inchoatum, ovario nullo, stylo 6 mm. longo, stigmatem magno discoideo 3 mm. diametro.

SOLOMON ISLANDS. Bougainville Island, Maisua, "a tree about 35 ft. in height," Jan. 1933, *Waterhouse* B. 825 (Y. 183).

Vernacular names—*sigu* (Siwai), *tabutabun* (New Britain), *pedeposa* (Buka).

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\*Continued from K.B. 1935, 306.

The New Guinea species of *Garcinia* were revised by Lauterbach (in Engl. Bot. Jahrb. 58, 15 : 1922) and more recently the genus as a whole has been treated by Engler (in Engl. & Prantl, Nat. Pflanzenfam. 2 Aufl. 21, 211 : 1925). *G. scaphopetalata* belongs to the section *Discostigma* in the classification adopted by these authors. One of its close allies, *G. umbonata*, is endemic to New Guinea, while *G. Warrenii* was described from Queensland but has since been recorded from New Guinea as well.

**Kingiodendron micranthum** B. L. Burtt [Leguminosae—Caesalpineae]; species nova a *K. alternifolio* (Elmer) Merrill et Rolfe inflorescentia maiore et glabra facile distinguitur.

*Arbor* circiter 18–21 m. alta. *Folia* pinnata, foliolis 3–4 alternis; petiolus 1–2.5 cm. longus, basi incrassatus et rugosus, glaber; foliola inter se 1.5–2.5 cm. distantia, petiolulis 7 mm. longis incrassatis et rugosis supra canaliculatis instructa; lamina plus minusve elliptica, levissime falcata, 9–20 cm. (plerumque 10–12 cm.) longa et 5–9 cm. (plerumque 6–8 cm.) lata, apice breviter acuminata, basi subito angustata vel fere rotundata, pellucido-punctata, glabra; costa supra leviter impressa, subtus prominens, nervis lateralibus 6–8 ut venulis utrinque prominulis. *Inflorescentia* axillaris, axe circiter 2.5 cm. longo racemos 3–8 usque ad 12 cm. longos simplices graciles flexuosos gerente, glabra. *Flores* parvi, bracteis minutis suffulti; alabastra orbicularia, 0.5 mm. diametro. *Pedicelli* 1.5 mm. longi, apice bracteolis 2 instructi. *Bracteolae* oppositae, ad calycem appressae, 0.5 mm. longae, acutae. *Sepala* 5, fere 2 mm. longa et 1.5 mm. lata, apice rotundata, marginibus ciliata, pellucido-punctata. *Petala* 0. *Stamina* 10; filamenta 1.75 mm. longa, basi pilosa; antherae minimae, dorsifixae. *Pistillum* 0.75 mm. longum, parce pubescens, stylo brevi et crasso. *Fructus* ignotus.

SOLOMON ISLANDS. Bougainville Island, Siwai, "a tree about 60–70 ft. high, somewhat resembles *Azalia*, stem buttressed at the base, good timber, near water and streams," Dec. 1932, *Waterhouse* B. 812 (Y. 172).

Vernacular names—*panorug* (Siwai), *kurinibangara* (Buka).

**Kingiodendron platycarpum** B. L. Burtt [Leguminosae—Caesalpineae]; species nova praecedenti, *K. micrantho* B. L. Burtt, affinis, sed ob foliola plerumque longiora et inflorescentiam pubescentem satis recedit.

*Arbor* usque ad 15 m. alta, ramulis subglabris griseis lenticellosis. *Folia* pinnata, foliolis 3–4 alternis; petiolus 1.5–4 cm. longus, ut ramuli griseus, basi incrassatus brunneus rugosus. *Foliola* inter se 2–3.5 cm. distantia; petioluli circiter 6 mm., parti incrassatae petioli similes; lamina elliptico-lanceolata, leviter falcata, 10–20 cm. longa, 4–6 cm. lata, apicem subobtusum versus sensim acuminata, basin versus abrupte angustata vel fere rotundata, glabra, pellucido-punctata; costa supra plana subtus prominens, nervis lateralibus

circiter 9, venulis vix prominentioribus et eiscum reticulum laxum formantibus. *Inflorescentia* ut in *K. micrantho* sed breviter et dense pubescens. *Pedicelli* 1 mm. longi, pubescens, bractea parva suffulti, apice bracteolas 2 vix ad medios sepalos attingentes gerentes. *Sepala* 5, suborbicularia, circiter 1.25 mm. longa et 1 mm. lata, pellucido-punctata, conspicue ciliata. *Petala* 0. *Stamina* 10, 1 mm. longa; antherae vix 0.5 mm. longae, dorsifixae; filamenta ad apicem angustata dimidio inferiore pilosa. *Ovarium* hirsutum, 1 mm. altum stylo crasso et stigmatibus inclusis. *Fructus* a lateribus in discum valde compressus, circiter 5 cm. longus et 5 cm. altus, semine uno magno plano.

FIJI ISLANDS. Viti Levu, Raki Mountains, "middle sized tree 35-40 ft. in height, not common," March 1878, *Horne* 483 (flowers; type). Vanua Levu, district of Bua, "large tree 40-50 ft. in dry parts near streams, wood hard and liked by the Fijians for many purposes," Sept. 1878, *Horne* 1121 (fruit).

Vernacular name—*moivei*.

The genus *Kingiodendron* was described by Harms (in Engl. & Prantl, Nat. Pflanzenfam. Nachtr. 1, 194: 1897) to receive *Hardwickia pinnata* Roxb., a native of the Western Ghats of southern India, which is distinguished from *Hardwickia* Roxb. *sensu stricto* (the only species of which is *H. binata* Roxb.) by its pinnate and pellucid-punctate leaves, dense inflorescence and small stigma. In 1909 Merrill and Rolfe (in Philipp. Journ. Sci. Bot. 4, 267: 1909) transferred to *Kingiodendron* a Philippine species, *K. alternifolium* (Elmer) Merrill et Rolfe, which Elmer had previously placed first in *Cynometra* and then in *Hardwickia*.

The description of *K. micranthum* and *K. platycarpum* results in a considerable extension of the eastward range of the genus, a matter of particular interest because its closest ally appears to be the American genus *Prioria* Griseb., the single species of which, *P. Copaisfera* Griseb., is found in the West Indies (Jamaica and Trinidad), Panama and Colombia.

In general appearance *P. Copaisfera* closely resembles *Kingiodendron platycarpum*, but is distinguished from it and the other species of *Kingiodendron* by its opposite leaflets and connate bracteoles and by the presence of a prolongation of the anther-connective. The pellucid-punctate leaflets and sepals and the very small petal-less flowers, as well as the inflorescence, the branches of which are simple spike-like racemes, indicate a close affinity between the two genera. The shape of the legume of *Prioria* also agrees closely with that of *K. platycarpum*, and it is perhaps significant that the latter species is closest to *Prioria* both geographically and morphologically.

The legume of *K. micranthum* is not yet known, but those of the three other species show rather more diversity than do other characters in this genus and, when present, provide the easiest



means of distinguishing the species. The legume of *K. pinnatum* is obovate, 3–4 cm. long and 2–3 cm. wide, laterally compressed, at least at the base below the seed and at the margins. In *K. alternifolium* the legume is about the same size, but more woody and only slightly (and evenly) compressed. In *K. platycarpum* the pod is very strongly compressed, about 5 cm. long and of the same depth, suborbicular in side view.

***Spiraeopsis celebica* (Bl.) Miq.?** [Cunoniaceae]; Miquel, Fl. Ind. Bat. 1, pt. 1, 719 (1856). *Cunonia celebica* Bl. Bijdr. 868 (1826). ? *Spiraeopsis philippinensis* Elmer, Leaf. Philipp. Bot. 8, 2826 (1915).

SOLOMON ISLANDS. Bougainville Island, Paramoni, Maisua, "a tree about 30–40 ft. high, 5–6 ft. in circumference," Sept. 1932, Waterhouse B. 738 (Y. 86).

Vernacular name—*donai*.

I have been unable to decide definitely whether the Bougainville plant is conspecific with *S. celebica* or not, there being very little material of the latter available for comparison. I have not seen the type specimen of *Cunonia celebica* Bl., which is the basis of Miquel's combination, but Koorders (Suppl. Fl. N.O. Celebes, 1, pt. 1. t. 7a–7b : 1918) has figured material which he collected from the same area, and duplicates of some of his specimens are in the Kew herbarium. There seems little doubt that Koorders identified his plant correctly, the only difference being, as he pointed out, that he found the plant to be monoecious whereas it had previously been described as dioecious. All the herbarium specimens seen have been entirely male or entirely female.

Specimens from the Philippine Islands have also been referred to *S. celebica* (Merrill and Rolfe in Philipp. Jour. Sci. Bot. 3, 101 : 1908), but Elmer (Leaf. Philipp. Bot. 8, 2826 : 1915) has since described *S. philippinensis* to which all the Philippine material must be referred, whether considered conspecific with *S. celebica* or not. The chief discrepancy between the two species is in the form of the stipules ; in true *S. celebica*, according to both Miquel and Koorders, they are dentate or serrate and Koorders figures serrate ones from a young plant : in *S. philippinensis* they are quite entire. In addition the indumentum of the undersurface of the leaves is denser in the Philippine specimens.

Engler (Engl. & Prantl, Natürl. Pflanzenfam. 2 Aufl. 18A, 246 : 1930) regarded *S. philippinensis* as a synonym of *S. celebica*, but called attention in his key to another plant from the Philippines which he distinguished, without giving it a name, by the presence of stipels. This character is, however, of no taxonomic value, for I find stipels on one of Koorders's specimens from Celebes, on one specimen from the Philippines and on some leaves of Waterhouse's Bougainville plant.

In the shape of the stipules the Bougainville specimens agree with *S. philippinensis*, but the leaves are larger and have only a thin indumentum on the lower surface; these differences might prove to be correlated with a damper and more shaded habitat. I have not seen any stipules of true *S. celebica* and cannot say whether the serrate form is normal or confined to young plants and coppice shoots. Under the circumstances I tentatively refer all the specimens to *S. celebica*, but when further material is available it may well be found that two or three separate species are represented.

***Canthium cymigerum* (Valeton) B. L. Burtt** [Rubiaceae-Vanguerieae] comb. nov.

*Plectronia cymigera* Valeton in Engl. Bot. Jahrb. **69**, 54 (1927).

N. E. NEW GUINEA. In den Wäldern des Maboro, Mai 1909, Schlechter 17513 (type).

SOLOMON ISLANDS. Bougainville Island, Siwai, "tree 30–60 ft., the larger trees with buttress base; timber close-grained and heavy; grated bark used in *kupi*—a marriage custom," Dec. 1932, Waterhouse Y. 163.

***Cyrtandra filibracteata* B. L. Burtt** [Gesneriaceae-Cyrtandreae]; species nova nulli arcte affinis. Verisimiliter prope *C. coleoidem* Seem. et *C. labiosam* A. Gray ponenda, sed bracteis filiformibus persistentibus et floribus unisexualibus inter alia valde recedit.

*Frutex* vel arbor parva, ut videtur dioica. *Ramuli* grisei, levissime pubescentes, siccitate longitudinaliter rugosi, internodiis 2.5–4 cm. longis. *Folia* opposita, utraque pars bene evoluta sed inaequalia; petiolus 0.5–2 cm. longus, supra sulcatus, primum brunneo-pilosus, glabrescens; lamina oblanceolata, vel minor pars plus minusve elliptica et inaequilateralis, circiter 10–22 cm. longa et 3.5–7.5 cm. lata, apice acuminata, ad basin angustata, marginibus praecipue supra mediam laminam dentato-crenulatis, supra primum tenuiter pilosa, subtus primum brunneo-tomentella, utrinque glabrescens; costa subtus prominens nervis lateralibus ascendentibus utrinsecus 12–16. *Bractae* filiformes in ramulis brevissimis editae, aliae steriles, aliae floriferae, fasciculum formantes, ad 1.8 cm. longae, supra sulcatae, ad basin versus sparse pubescentes, ad apicem saepe glabrescentes. *Flores* unisexuales. *Pedicellus* 5 mm. longus, pubescens. *Calyx* bilabiatus vel subspathaceus, 5 mm. longus, tenuis, extra breviter pubescens. *Corolla* 1.7–2 cm. longa, tubo leviter curvato, bilabiata; labium inferius e lobo uno lanceolato 7 mm. longo; labium superius 4-lobatum, lobis 2 inferioribus obtusis margine inferiore 7 mm. longa, superiore 2 mm. longa, 2 superioribus acutis 2 mm. longis sinu 1 mm. profundo seiunctis. *Staminodia* in typo nulla, in specimine Guppyano staminodia 5 parva praesentia. *Ovarium* 0.5 cm. longum, glabrum, in stylo 1.5 cm. longo productum. *Stigma* capitatum leviter bilobatum. *Fructus* oblongus vel ovoideus, 1–1.3 cm. longus, 3–5 mm. crassus.

SOLOMON ISLANDS. *Guppy* s.n. (comm. 1885). Bougainville Island, Siwai, "shrub or small tree," July 1930, *Waterhouse* B. 132 (type); "a small tree," *Waterhouse* Y. 134.

Vernacular names—*tipaka*, *pokotipa*.

*Guppy*'s specimen, which was examined by the late Dr. O. Stapf whose notes I have had the advantage of using, differs from those collected by Waterhouse, in having staminodes and in the shorter, more ovoid fruit: it is very incomplete and no leaves are present, but if not identical, it is at least very closely allied to the Bougainville plant.

*Cyrtandra filibracteata* is referable to the section *Polynesiceae* in the classification proposed by C. B. Clarke (in A. and C. De Candolle, Monogr. Phan. 5, pt. 1, 201: 1883): it does not, however, fit exactly into any of the seven groups into which Clarke classified the species of this section. *C. filibracteata* has its closest affinity with *C. coleoides* Seem. (Fl. Vit. 181 and t. 40) and *C. labiosa* A. Gray (in Proc. Amer. Acad. 6, 40: 1862). The former is a native of Fiji and agrees with *C. filibracteata* in having both leaves of each pair well, but rather unequally, developed. The flowers of *S. coleoides* are mainly borne on the old wood, but the bracts are apparently caducous, there being none present on any of the material examined, and the peduncles are 1-3-flowered. The calyx is much the same as in *C. filibracteata* but the corolla has the three lower lobes more or less equal and ovate-triangular, the upper two smaller and with a rather shallow sinus between them. This contrasts sharply with the corolla of *C. filibracteata*, which has a very narrow lower median lobe and an upper lip formed of the two obtuse lower laterals and the more acute upper laterals. In this respect it agrees more closely with *C. labiosa* A. Gray, a species native to Samoa and still very imperfectly known, which differs from *C. coleoides* Seem. in having the lower median lobe longer and narrower than the lower laterals.

The New Guinea *Gesneriaceae* have been revised by Schlechter (in Engl. Bot. Jahrb. 58, 255: 1923), who has proposed a completely new classification of the species of *Cyrtandra* found in that region. If we follow this, *C. filibracteata* must be referred to the section *Macrocyrtandra* of the subgenus *Glossophora*. I cannot, however, find any close affinity for it in this section, nor indeed among any of the New Guinea or Malayan species.

Attention is drawn in the diagnosis to the fact that *C. filibracteata* has unisexual flowers. This is a character which has been used by Lauterbach (in Nova Guinea, 8, 331 and t. 66: 1910) as the basis for the establishment of a distinct genus, *Cyrtandropsis*. In the single species of this genus, *Cyrtandropsis monoica*, Lauterbach reported finding male and female flowers in the same inflorescence, and from his short note following the generic description it is evident that he regarded the unisexual nature of the flowers as the main, and indeed the only, basis for the genus.

Schlechter, in his revision of the New Guinea *Gesneriaceae*, added fifteen more species to *Cyrtandropsis*, thirteen being described for the first time, the other two being transferred from *Cyrtandra* : all these were found to be dioecious. I have seen only a few of these species, and cannot, therefore, say whether they are truly allied to one another, or merely agree in having unisexual flowers.

The only species of *Cyrtandropsis* so far described from outside New Guinea is the Hawaiian *C. kaululuensis* Hochreutiner (in Candollea, 5, 215 : 1934). Hochreutiner, although he retained *Cyrtandropsis* as a distinct genus, called attention to its discontinuous distribution, and suggested that this could only be explained by the assumption that the unisexual condition of the flowers had arisen within the genus *Cyrtandra* on more than one occasion.

I have compared *Cyrtandra filibracteata* with those species of *Cyrtandropsis* which are represented in the Kew herbarium, and fail to find any evidence of a close affinity. Nor does it agree at all closely with the description of *Cyrtandropsis finisterrae* Schlechter, to which it comes closest in the key. None of these species has the conspicuously bilabiate corolla or persistent, filiform bracts of *Cyrtandra filibracteata*, and *Cyrtandropsis finisterrae* is the only one to have both leaves of each pair well-developed. This being so it is undesirable to separate *Cyrtandra filibracteata* from its probable allies in *Cyrtandra* and to describe it as a species of *Cyrtandropsis* solely on account of its unisexual flowers ; furthermore, it is very unlikely that *Cyrtandropsis* will eventually be retained as a distinct genus unless other supplementary characters are found.

**Finschia Waterhousiana** B. L. Burt [Proteaceae—Grevilleae] ; species nova a *F. rufa* Warb. foliis adultis utrinque costa excepta glabris, ovario et gynophoro glabro differt. Ab etiam affini *F. chloroxantha* Diels foliis minoribus nervo intramarginali minus conspicuo basin versus abruptius angustatis, perianthio et gynophoro et stylo longioribus facile distinguenda.

*Arbor* fere usque ad 30 m. alta. *Ramuli* breviter et appresse rufo-pubescentes, demum glabrescentes. *Folia* alterna, petiolata ; petiolus circiter 2 cm. longus, supra planus, subtus obtuse carinatus, leviter pubescens ; lamina elliptica, circiter 15-22 cm. longa et 6.5-10 cm. lata (apice irrupto non viso), basi cuneata, marginibus undulata, utrinque primum sparse rufo-pubescent, demum costa excepta glabrescent. *Inflorescentia* racemosa, in ramis vetustioribus axillaris, circiter 15-20 cm. longa, axe breviter rufo-pubescente, floribus binatis ebracteatis. *Pedicellus* 8 mm. longus, ut axis breviter rufo-pubescent, apice incrassatus, receptaculo leviter obliquo. *Perianthium* extra breviter rufo-pubescent ; tubus 8 mm. longus, uno latere scissus, apice in limbo globoso e lobis 4 ellipticis 2 mm. longis circum stigma cohaerentibus dilatatus. *Stamina* 4 in lobis perianthii sessilia, antheris 1.25 mm. longis. *Discus* hippocrepiiformis, vix 1 mm. altus, gynophorum haud includens, glaber.

*Gynophorum* 4 mm. longum, glabrum. *Ovarium* parvum, 1 mm. longum et latum, ovulis 2 pendulis instructum. *Stylus* 1 cm. longus, ut gynophorum et ovarium minute papillosus, stigmatibus conico coronatus. *Fructus* ignotus.

SOLOMON ISLANDS. Siwai, Bougainville, Jan. 1933, *Waterhouse* Y. 187 "Specimen from a tree 40–50 ft., but some almost double that height. A handsome golden flower and useful nicely grained timber. Fruit edible. Apparently not known in New Britain."

Vernacular names—*togtua*, *kanokele*.

*Finschia Waterhousiana* is the third species of this genus to be discovered, the other two, *F. rufa* Warb. and *F. chloroxantha* Diels being natives of New Guinea. *Finschia* may be distinguished from *Kermadecia* by its long gynophore and horse-shoe-shaped disc. It has the facies of some species of *Helicia*, which differs, however, in having anthers on short filaments inserted below the lamina, a sessile ovary and either 4 distinct hypogynous glands or an annular or cupular disc.

#### XLIV—MISCELLANEOUS NOTES.

**Trees and Shrubs of Kenya Colony.\***—This is a revision and enlargement of Mr. Battiscombe's useful book on the common trees and woody plants of the colony, published by the Crown Agents for the Colonies in 1926, and now out of print.

A large number of additional species collected by members of the Forest Department in the 10 years interval have been added, although some of the entries can hardly claim to be either trees or shrubs, such as *Cleome strigosa* Oliv. and *Bidens pilosa* L.

It is much to be regretted that, owing to financial stringency, it has not been possible to include the excellent photographs published in the first edition. One presumes that if the original blocks were available their inclusion would not have added very much to production costs.

A useful feature of the new book is the addition of many more vernacular names, which are arranged in ten groups of allied native tribes, and of an introductory chapter describing the main forest-types of Kenya.

The description of the additional species, etc., is mainly the work of Mr. I. R. Dale, Assistant Conservator of Forests.

J. HUTCHINSON.

**Forest Flora of Southern Nigeria†.**—This book is not quite what one might expect from its title, for it is mainly devoted to field notes on Mr. Kennedy's own collection. As such it is a valuable contribution to our knowledge of the forest flora of the region,

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\* "Trees and Shrubs of Kenya Colony." Nairobi, Government Printer, 1936. 1p. 201. Price 5s.

† By J. D. Kennedy, M.B.E., Dip. For. (Edinb.), Sylviculturist, Nigerian Forest Services. Lagos; Government Printer. 1936. Price 10s. 0d. Net.

about which we have had little first hand information up to the present. It will be a useful supplement to the botanical information provided by the "Flora of West Tropical Africa" and is fortunately arranged according to the same classification.

Mr. Kennedy has collected a considerable amount of information about the species he has met with in the field, or rather forest, giving native names where known, which are also separately indexed at the end of the book. It is particularly interesting to the writer of this note to learn something of the habits of species which he knows almost entirely from herbarium specimens.

Mr. Kennedy's field numbers would have been better quoted immediately after the name of the species and not on a separate line at the end of the description, particularly when they come at the top of a page, as on pp. 28 and 29, where the number might be thought to belong to the species below.

Except for a few misprints and the unfortunate insertion of the word "Monocotyledones" under the *Gymnospermae* on p. 7, we have no fault to find with this book which is heartily welcomed, and it is to be hoped that Mr. Kennedy's example will be followed by other foresters in Africa.

J. HUTCHINSON.

**Botanical Magazine.**—Part 3 of vol. 159 was published on July 31st and contains the following plant portraits and descriptions:—

*Rhododendron rhabdotum* Balf. f et Cooper (t. 9447), a native of Bhutan; *Penstemon ambiguus* Torrey (t. 9448), a very distinct phlox-like species found in the S.W. United States and Mexico; *Sarcococca humilis* Stapf (t. 9449), a useful evergreen shrub, first found by Augustine Henry in W. Hupeh, E. Szechwan and Yunnan; *Lavatera assurgentiflora* Kellogg (t. 9450), from the islands off the coast of California; *Primula Wigramiana* W. W. Sm. (t. 9451), a beautiful white *Soldanella*-like *Primula* from the high mountains of Nepal; *Sutera grandiflora* (Galpin) Hiern (t. 9452), a useful mauve-flowered garden plant native of the Eastern Transvaal; *Eria amica* Reichb. f. (t. 9453), distributed from N. E. India through Yunnan to Formosa; *Cotoneaster lactea* W. W. Sm. (t. 9454), a recent introduction from Yunnan by George Forrest; *Pelargonium Andrewsii* (Sweet) G. Don. (t. 9455), from the Cape, remarkable for its polymorphic leaves; *Gaultheria codonantha* Airy Shaw (t. 9456), a striking green-flowered shrub endemic in Upper Assam; and *Leucocoryne ixioides* (Hook.) Lindley (t. 9457), the beautiful mauve-blue "lily" from S. Chile.

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**Mushrooms.\***—Although written primarily for American readers, this little book should prove valuable to beginners every-

\* "The Mushroom Handbook." By Louis C. C. Krieger. Macmillan & Co., London and New York, 1936. Pp. xiv + 530, 125 uncoloured illustrations in the text, 32 coloured plates. Price 15s. net.

where as an introduction to the study of the larger fungi. The first half of the volume contains information as to the classification of the larger fungi, the conditions under which they grow, life histories, economic importance, etc., all written in a popular and readable style. An excellent feature is a guide to the literature on the fungi, so that those who wish to go beyond the superficial recognition of common edible and poisonous species are shown where to pursue their studies. There are also notes as to methods of collection and preservation for the herbarium, and the characters to be noted in writing descriptions. The latter part of the book consists of detailed descriptions of species. Some of these are American species or varieties which do not occur in Britain, but many are common to both Europe and North America. The author's use of the word "mushroom" for the larger fungi in general is at first a little confusing to English readers. The black-and-white illustrations are good and the coloured plates are excellent reproductions of the author's beautiful drawings. The book is of a useful size for field work, and the typography excellent ; there appear to be very few errors.

E. M. WAKEFIELD.

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**Empire Minor Forest Products\*.**—This useful publication has been prepared as the result of a resolution passed at the Imperial Conference of 1930. Its compilation has been carried out by the Imperial Economic Committee in consultation with the Forest Departments of the Empire, the Imperial Institute, and Kew. The term minor forest product is understood to signify any product of the natural forest other than timber and its derivatives. Between five and six hundred products from thirty-seven Empire countries are listed and more than four hundred bibliographical references are given. The products are arranged in the following groups, each group being preceded by short introductory remarks :—drugs and spices, dyes, essential oils, fibres, gums and resins, oils and oil seeds, tanning materials, and miscellaneous.

The information supplied for each product is arranged in five columns. It includes the common name of each commodity, the botanical name of the plant yielding it, the country of origin and its relative importance in that country, export figures (where known) and references to literature. The full indexes supplied will no doubt render the work easy of reference. It should prove useful to merchants, forest officers and administrators by supplying information in a handy form, and may also be helpful to forest officers of the Empire when considering the economic possibilities of little known forest products.

F. N. HOWES.

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\* "An Index of the Minor Forest Products of the British Empire". Printed and published for the Imperial Economic Committee by His Majesty's Stationery Office, London, 1936. Pp. 116. Price 5s. 0d. net. (5s. 3d. post free).

BULLETIN OF MISCELLANEOUS  
INFORMATION No. 9 1936  
ROYAL BOTANIC GARDENS, KEW

XLV—TROPICAL AFRICAN PLANTS: XIV.\*

**Dovyalis xanthocarpa** *Bullock*, sp. nov. [Flacourtiaceae]; fructibus esculentis flavidis velutinis distincta.

*Frutex* vel *arbor*, usque ad 10 m. alta, dioica, inermis, ramosissima; rami striati, lenticellis parvis leviter obtecti, demum glabri; ramuli graciles, satis dense patente pilosi. *Folia* ovata vel elliptica vel plus minusve obovata, usque ad 11 cm. longa et 6 cm. lata, sed plerumque minora, apice acuta vel acute cuspidata, marginibus integra, supra parce pubescentia, sed costa et nervis lateralibus (utrinsecus 3–6) adscendentibus subadpresse pilosa, venis venulisque tenuiter reticulata, petiolis usque ad 1 cm. longis dense pilosis. *Flores masculi* ex axillis foliorum maturorum vel delapsorum in cymas paucifloras orti; pedunculi breves, velutino-pubescentes, 1–2 mm. longi; pedicelli velutino-pubescentes, 3–5 mm. longi, basi articulati, ex axillis bractearum parvarum orti; sepala 8, lanceolata, acuta, 3 mm. longa, 1.2 mm. lata, late patentia, utrinque velutino-pubescentia; stamina numerosa, filamentis filiformibus 2 mm. longis, antheris parvis globosis; ovarium nullum. *Flores feminei* solitaires; pedunculi ebracteati, 1–1.5 cm. longi, infra medium articulati, velutino-pubescentes; sepala 8, persistentia, lanceolata, apice longissime acuminata, 7 mm. longa, 1.5 mm. lata, in statu fructifero leviter accrescentia, utrinque velutino-pubescentia; stamina atque staminodia nulla; ovarium ellipsoideum, dense flavido-velutino-pubescentia, 4 mm. altum, 2 mm. diametro, biloculare; ovula in loculis basilaria solitaria; styli 2, pubescentes, apice stigmatoso-trifidi. *Fructus* carnosi, esculenti, stylis persistentibus coronati, flavidi, velutini, ellipsoidei, 2 cm. alti, 1.3 cm. diametro; semina 2, in loculis solitaria, albuminosa; embryo recta, satis magna, cotyledonibus rotundatis basi cordatis 7 mm. diametro praedita.

TANGANYIKA TERRITORY. Dodoma District. Very local in the shade of riverine fringing forest of *Khaya*, *Parkia*, *Teclea*, *Ficus*, etc., on alluvial soil, at Kikombo near Mpwapwa, 1050 m., Nov. 1933 (♀ fl. and fr.), *Burt* 5006 (type):—a spreading much branched tree 30 ft. high; bark smooth; fruits orange and alleged by natives to be edible. Locally common in thicket of *Grewia pachycalyx*, *Vernonia senegalensis*, *Fluggea* sp. etc., with *Acacia usambarensis* at Matamondo Valley near Mpwapwa, 900 m., Jan. 1933 (♂ fl.), *Burt* 5045:—a spreading shrub 12 ft. high with many small yellow flowers. In alluvial soil, at Mpwapwa, 1050 m., Dec. 1930, (♀ fl. and fr.), *Hornby* 344:—a tree

\*Continued from Kew Bulletin 1935, 285.



6 m. high with white flowers and yellow edible fruits.

The large yellow or orange fruits of this species are very characteristic and serve to distinguish it from all other African species of the genus, though it is allied to a Southern Rhodesian species as yet undescribed.

***Grewia filiformis* Bullock**, sp. nov. [Tiliaceae]; inter congeneres pedunculis solitariis longe filiformibus distinctissima.

*Frutex* ramosus; rami ramulique graciles, 15 cm. infra apicem 1.5–2 mm. diametro, teretes, plus minusve striati, glabri. *Ramuli abbreviati* perulati, 3–7 mm. longi, flores singulos et interdum folia 1–2 gerentes. *Folia* tenuiter herbacea, utrinque glabra, obovata, usque ad 5 cm. longa et 2.5 cm. lata sed saepe minora, apice late truncata, basin versus angustata sed basi anguste truncata, marginibus irregulariter subdistante repando-dentata, e basi 3-costata, venis venulisque tenuiter reticulata; petioli graciles, circiter 6 mm. longi; stipulae subulato-lanceolatae, 5–6 mm. longae, scariosae, caducae. *Flores* solitarii, ramulos abbreviatis vel etiam elongatis terminantes; pedunculi filiformes, 4–5 cm. longi, supra duos trientes incrassato-articulati, glabri. *Sepala* anguste oblonga, 1.8 cm. longa, 3–3.5 mm. lata, apice subacuta vel obtusiuscule apiculata, extra puberula, intus basin versus tantum puberula, marginibus hyalinis. *Petala* anguste obovata vel late oblanceolata, 1.8 cm. longa, 7 mm. lata, apice ambitu rotundata et retuso-emarginata, basin versus angustata, utrinque glabra, basi appendice adnato rotundato-obovato ultra 2 mm. longo 1.5 mm. lato dense villosa-ciliato praedita, area nectarifera supra basali 1 mm. diametro. *Gynophorum* 2.5 mm. altum, apice villosa-annulatum, ceterum glabrum. *Filamenta* filiformia, glabra, leviter inaequilonga, 1–2.2 cm. longa. *Ovarium* globosum, 1.5 mm. diametro, pilis rigidis erectis satis dense indutum. *Stylus* gracilis, 1.1 cm. longus, apice stigmatoso-bifidus, infra medium pilis stellatis pubescens. *Fructus* non visi.

KENYA COLONY. Mtito Andei, 750 m., *Battiscombe* (For. Dep. 922): —a shrub.

This plant was received at Kew in April, 1919, and has not appeared in any of the numerous representative collections received since that date. It is now described, in spite of the lack of fruit, which should supply valuable diagnostic characters, in the hope that collectors will make a search for it. *Grewia filiformis* is unique in the genus on account of its long filiform peduncles, which are articulated some distance above the middle.

***Indigofera annua* Milne-Redhead**, sp. nov. [Papilionaceae]; ab *I. asparagoïdi* Taub. habitu humili suberecto compacto haud decumbente, foliis superioribus digitate trifoliolatis facile distinguenda.

*Herba* annua usque 18 cm. alta, densiuscule ramosa. *Rami* ascendentes vel leviter patentes, graciles, teretes, glabri; internodia

usque 2 cm. longa. *Folia* superiora digitate trifoliolata, usque 5 cm. longa plerumque minora ; inferiora integra, obovata, in petiolum angustata, apice acuta, usque 1.5 cm. longa et 0.5 cm. lata ; stipula subulata, circiter 0.5 mm. longa ; petiolus angustissime alatus, 5–10 mm. longus, glaber ; foliola breviter petiolata, angustissimi linearia, 1.5–3.8 cm. longa, usque 1 mm. lata, acuta, plana vel margine incurvata subulata, sparsiuscule adpresse hirsuta. *Racemi* numerosi, axillares, 3–6-flori, tenuissimi, usque 5 cm. longi ; pedunculus et rhachis glabra ; bracteae circiter 0.5 mm. longae, persistentes ; pedicelli circiter 2 mm. longi. *Calyx* circiter 1.5 mm. longus, extra parvisime albo-hirsutus. *Corolla* minima. *Stamina* circiter 3 mm. longa ; antherae apiculatae. *Ovarium* filiforme, glabrum ; stylus filiformis, glaber ; stigma minutum, capitatum. *Legumen* rectum, ascendens, subcylindricum, suturis leviter crassatis, usque 2.4 cm. longum, 1.5 mm. latum, glabrum. *Semina* 10–20, rectangularia, compressa, circiter 1 mm. longa et lata, lucida, pallide luteo-brunnea.

SOUTHERN RHODESIA. Wankie, April 1932, *Levy* 36 (Nat. Herb. Pretoria 20168 (type), Transv. Mus. Herb. 30608, Kew Herb.).

The material of this species which Mr. B. Levy collected is all in fruit. The few flowers which are available prove to be too delicate to allow of dissection, and consequently the shapes and sizes of the petals have had to be omitted from the above description. The plant however is so very distinct that it seems desirable to describe it.

***Indigofera shinyangensis* Milne-Redhead, sp. nov.** [Papilionaceae] ; ab *I. subargentea* De Wild. foliolo latiore et obtusiore, racemis multifloris, floribus majoribus, carina apicem versus pilis crispidulis hirsuta, legumine densissime hirsuto differt.

*Herba* annua usque 5 dm. alta, conspicue ramosa. *Rami* patentes praecipue inferiores, graciles, leviter angulati, adpresse albo-hirsuti, demum glabrescentes ; internodia 1–8 cm. longa. *Folia* 3–9-jugata, usque 5 cm. longa, stipulata, stipulis subulatis usque 4 mm. longis plus minusve persistentibus ; petiolus usque 7 mm. longus, adpresse albo-hirsutus ; rhachis usque 3.5 cm. longa, adpresse albo-hirsuta ; foliola breviter petiolulata, elliptica, oblongo-elliptica vel obovato-elliptica, 6–12 mm. longa, 3–5 mm. lata, apice rotundata, truncata, vel leviter emarginata, minute apiculata, basi plus minusve rotundata utrinque adpresse albo-hirsuta praecipue pagina inferiore. *Racemi* numerosi, axillares, multiflori, usque 6 cm. longi ; pedunculus et rhachis densiuscule albo-hirsuta ; bracteae lanceolato-subulatae, extra albo-hirsutae, circiter 3 mm. longae, caducae ; pedicelli circiter 1 mm. longi, hirsuti. *Calyx* 4.5 mm. longus ; tubus brevissimus, vix 1 mm. longus, extra dense hirsutus ; lobi subulati, usque 3.5 mm. longi, parce albo-hirsuti, apice glabri. *Vexillum* rotundato-triangulare, circiter 5 mm. longum et latum, apice rotundatum, basi haud unguiculatum, sed obtuse lobatum, extra superne crispidule hirsutum, intus glabrum ; alae oblique obtriangulares, circiter 5 mm. longae et 2.5 mm. latae, basi in unguem angustatae, glabrae ; carina

superne cymbiformis, apice acuta, inferne in unguem attenuata, utroque latere in calcarem angustum 1.5 mm. longum deflexum producta, circiter 7 mm. longa et 2 mm. lata, superne extra crispidule hirsuta. *Stamina* circiter 5 mm. longa; antherae 0.8 mm. longae, minute apiculatae. *Ovarium* subfiliforme, circiter 2.5 mm. longum, dense adpresse hirsutum; stylus filiformis, valde curvatus, circiter 4 mm. longus, glaber; stigma minutum, capitatum. *Legumen* rectum, patens, subcylindricum, circiter 2 cm. longum et 1.5 mm. diametro, extra densissime adpresse hirsutum, et pilis rigidis erectis parce inspersum. *Semina* circiter 10, matura non visa.

TANGANYIKA TERRITORY. Mwanza, *Davis* 258. Shinyanga, April 1933, *Bax* 152 (type): — annual, 1 ft. high; flowers pink. Common in Huru-huru mbuga and Shinyanga area generally, 23 March 1932, *Staples* 437. Very abundant everywhere, Shinyanga, 1200 m., Febr. 1935, *Burti* 5147:—flowers salmon-pink.

***Indigofera tenuis* Milne-Redhead**, sp. nov. [Papilionaceae]; ab *I. wituensi* Bak. f. foliolis supra aequabiliter hirsutis, lobis calycis brevioribus, legumine glabro differt.

*Herba* annua usque 3 dm. (1 m. fide Wallace) alta, conspicue ramosa. *Rami* patentes, inferiores decumbentes, graciles, teretes vel obscure angulati, parcissime adpresse albo-hirsuti, demum glabrescentes; internodia 1–3 cm. longa. *Folia* 2–4-jugata, usque 2.5 cm. longa, stipulata, stipulis subulatis usque 4 mm. longis plus minusve persistentibus; petiolus 1–3 cm. longus, parce adpresse albo-hirsutus; rhachis usque 1.5 cm. longa, parce adpresse albo-hirsuta; foliola breviter petiolulata, oblonga vel oblanceolata, usque 14 mm. longa et 4 mm. lata, apice acuta vel rotundata, minute apiculata, basi cuneata, utrinque adpresse albo-hirsuta praecipue pagina inferiore. *Racemi* numerosi, axillares, 1–4-flori, usque 2.5 cm. longi; pedunculus et rhachis glabra; bractae subulatae, extra albo-hirsutae, circiter 2 mm. longae, caducae; pedicelli 0.5 mm. longi, glabri. *Calyx* circiter 2 mm. longus; tubus 1 mm. longus, extra parce albo-hirsutus; lobi subulati, circiter 1 mm. longi, glabri. *Vexillum* rotundato-triangulare, circiter 4 mm. longum et latum, apice rotundatum, basi in ungem brevem latum angustatum, extra superne crispidule hirsutum, intus glabrum; alae oblique obtriangulares, circiter 4 mm. longae et 2 mm. latae, basi in unguem latum angustatae, glabrae; carina superne cymbiformis, apice obtusa, inferne in unguem attenuata, utroque latere in calcarem angustum 0.5 mm. longum deflexum producta, circiter 4.5 mm. longa, 1.5 mm. lata, superne extra crispidule hirsuta. *Stamina* circiter 4 mm. longa; antherae 0.5 mm. longae, minutae apiculatae. *Ovarium* filiforme, circiter 2 mm. longum, parce adpresse hirsutum; stylus filiformis, valde curvatus, circiter 2 mm. longus, glaber; stigma minutum capitatum. *Legumen* rectum, ascendens, subcylindricum, circiter 1–1.4 cm. longum et 1.5 mm. diametro, parcissime adpresse albo-hirsutum. *Semina* circiter 10, matura non visa.

**KENYA COLONY.** Turkana Province : Oropoi Valley, 1000–1200 m., June–July 1930, *Liebenberg* 286.

**TANGANYIKA TERRITORY.** Mwanza, *Davis* 61, 289. Mwanza, 1100 m., 23 Feb. 1933, *Wallace* 599 : — woody herb, 4 ft. high. Shinyanga, in pathways on fairly dry ground, Febr. 1933, *Bax* 151 (type) : — annual, 9 inches to 1 ft. high ; flowers deep pink. Shinyanga, in short-grassed hard-pan soils, 1200 m., Febr. 1935, *Burt* 5094 : — a pretty red-flowered herb growing commonly everywhere. Shinyanga, very common in *Hyparrhenia* savannah and old cultivation on decayed granite soils, 1140 m., 30 March 1932, *Burt* 3779a\* (Brit. Mus. Herb.) : — flowers brick-red, forming splashes of colour.

In some of the species examined the peduncle and rhachis of the inflorescence have a few adpressed white hairs. The subulate calyx segments are often longer than the measurement given for the type specimen. The specimen from Kenya Colony (*Liebenberg* 286) is rather more hairy than the Tanganyika specimens, but agrees with them in all other respects.

***Vigna macrorrhyncha* (Harms) Milne-Redhead**, comb. nov. [Papilionaceae]. *Phaseolus Schimper* Taub. in Engl. Hochgebirgsh. Trop. Afr. 267 (1892) ; Engl. Pflanzenw. Ost-Afr. C. 223 (1895) ; Harms in Engl. Pflanzenw. Afr., 3, i, 695 (1915) ; Bak. f. Leg. Trop. Afr. 390 (1929), non *Vigna Schimper* Bak. *Phaseolus macrorrhynchus* Harms in Engl. Bot. Jahrb. 28, 409 (1900) and in Engl. Pflanzenw. Afr. 3, I, 695 (1915) ; Bak. f. Leg. Trop. Afr. 390 (1929).

**NIGERIA.** Naraguta, *Lely* 552.

**ABYSSINIA.** Mt. Edda-Girgis near Acksum [Aksum ?], 2300 m., *Schimper* s.n. (type of *P. Schimper* Taub.)

**ANGLO-EGYPTIAN SUDAN.** Darfur Province : Jebel Marra, *Mrs. Macintosh* 96.

**UGANDA.** Sanga Rest Camp, Ankole, 1300 m., *Eggeling* 614 (Forestry Dept. 989). Mile 13, Kampala–Entebbe Road, *Eggeling* 279 (F.D. 560). Serere, *Chandler* 1015. Siroko Valley, Mt. Elgon, 1200–1500 m., *Snowden* 1049.

**KENYA COLONY.** Kipkarren district, *Brodhurst-Hill* 223. Utembe, 1350 m., *Napier* 2947 (Coryndon Museum 5300). Nyali Estate, Mombasa, *Napier* 3363 (C. M. 6308).

**TANGANYIKA TERRITORY.** Bukoba District : Kabirizi, 1200 m., *Haarer* 2260. Shinyanga, *Bax* 165, 166. Morogoro District, 330 m., and 480 m., *Wallace* 418, 418a. S. Uluguru, Mbakana, 600 m. *Goetze* 345 (type). Iringa Province, Msima Stock Farm, *Emson* 244.

**NORTHERN RHODESIA.** Mumbwa, *Mrs. Macaulay* 398, 1161.

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\*This is a mixed gathering, *Burt* 3779 being a distinct species.

I am indebted to Dr. H. G. Schweickerdt, who, whilst working at the Berlin Herbarium, carefully compared the types of *Phaseolus Schimperii* Taub. and *P. macrorrhynchus* Harms, and reported that he believed the two species to be conspecific, in spite of considerable variation in the size of the flowers, a character which appears to depend at least partly on the vigour of the plant. The material at Kew shows also a large variation in the shape of the leaflets. An examination of the flowers of *Phaseolus Schimperii* makes me think that the species is better placed in *Vigna*, in spite of its somewhat twisted keel. The habit, foliage and fruit agree very closely with certain species of *Vigna*, and according to the key to that genus in E. G. Baker's "Leguminosae of Tropical Africa," the species falls into the section *Microdontae*, near to *Vigna pseudolablab* Harms.

***Salix subserrata* Willd.** Sp. Pl. 4, 671 (1806) [Salicaceae]; Pers. Syn. 2, 600 (1807); Poir. Encycl. Méth. suppl. 5, 58 (1817); Hiern in Cat. Afr. Pl. Welw. 1, 1030 (1900). *S. safsaf baelledi* Forsk. Fl. Ægypt-Arab. p. lxxvi (1775), sine descr. *S. Safsaf* Forsk. ex Trautv. Salic. 6, t. 2 (1836); Anderss. Monogr. Salic. 10, t. 1 (1865); Solms in Schweinf. Beitr. Fl. Aethiop. 187 (1867); Anderss. in DC. Prodr. 16, ii, 196 (1868); Boiss. Fl. Orient. 4, 1183 (1879); Engl. Hochgebirgsfl. Trop. Afr. 189 (1892); Post Fl. Syr. Palest. Sin. 742 (1896); ed. 2, 2, 529 (1933); Muschl. Man. Fl. Egypt, 242 (1912); Skan in Prain Fl. Trop. Afr. 6, ii, 318 (1917); Broun & Massey Fl. Sudan 209 (1929); Hutch. in Kew Bull. 1931, 165 (1931), et 1934, 287 (1934). *S. octandra* Sieb. ex A. Rich. Tent. Fl. Abyss. 2, 276 (1851).

As published by Forsskål in 1775, the name *S. safsaf baelledi* has no standing, as it appears in a list without a description. The epithet *Safsaf* was not published with a description until Trautvetter took it up in 1836. In the mean time (1806) Willdenow had published a description, also based on Forsskål's specimen, and had given the name *S. subserrata* to the species, thus antedating *S. Safsaf* Forsk. ex Trautv. by thirty years. Hiern in his account of Welwitsch's Angolan plants, rightly adopted Willdenow's name, but many botanists still retain the invalid name *S. Safsaf* Forsk. E.M.-R.

***Loranthus (Constrictiflori) Gomesii* E. A. Bruce**, sp. nov. [Loranthaceae]; affinis *L. ogowensi* Engl., sed foliis lineari-lanceolatis vel falcatis differt.

*Rami* griseo-brunnei, subtiliter lenticellati et striati, glabri, 4-6 mm. diametro, internodiis 2.5-6.5 cm. longis. *Folia* opposita vel subopposita, falcata vel lineari-lanceolata, apice rotundata vel subacuta, basi cuneata, 6-15 cm. longa, 1-2.5 cm. lata, coriacea, glabra; nervi laterales utrinsecus 3-5, costae mediae subparalleli; petioli 0.6-1 cm. longi, glabri. *Umbellae* axillares, fasciculatae, 3-4 florum; pedunculus 3-4 mm. longus, glaber; pedicelli 1-2 mm. longi; bracteae ovato-cupulares, acutae vel subacutae, margine dorsali minute ciliolato 4 mm. longo ventrali 2.5 mm. longo. *Calyx*

(receptaculo incluso) campanulatus, circiter 5 mm. longus, glaber, subtruncatus, margine irregulariter fisso. *Alabastra* apice ellipsoidea, depresso-truncata, 5-cornuta. *Corolla* rubra, glabra, tubo circiter 3.5 cm. longo unilateraliter fisso, ampulla basali ellipsoidea circiter 6 mm. longa, lobis reflexis spathulatis circiter 6 mm. longis apice crassis in appendicem dorsalem 1.5 mm. longam productis. *Filamenta* fere 3 mm. infra basin corollae loborum inserta, involuta, circiter 8 mm. longa, dente ventrali 0.75 mm. longo; antherae anguste oblongae, 2-2.5 mm. longae. *Stylus* superne metuliformis, parte incrassata circiter 6 mm. longa, collo 2 mm. longo; stigma ellipsoideum, 0.9 mm. longum.

PORTUGUESE EAST AFRICA. Near Inhambane, Oct. 1935, *Gomes e Sousa* 1664 (type):—a parasite on *Brachystegia*; flowers red.

**Loranthus meridianus** E. A. Bruce, comb. nov. [Loranthaceae]. *Tapinostemma meridianum* Danser in Notizbl. Bot. Gart. Berlin, **11**, 216 (1931). *Loranthus Ngurukizi* E. A. Bruce in Kew Bull. 1933, 470 (1933).

**Fagaropsis Hildebrandtii** (Engl.) Milne-Redhead, comb. nov. [Rutaceae]. *Clausena*? *Hildebrandtii* Engl. Pflanzenw. Ost-Afr. C, 229 (1895). *C. Hildebrandtii* Engl. in Engl. Pflanzenw. Afr. **3**, i, 758 (1915) and in Engl. Pflanzenfam. ed. 2, **19A**, 322 (1931). *Clausenopsis Hildebrandtii* Milne-Redhead in Kew Bull. 1935, 278 (1935).

I am grateful to Mr. A. W. Exell of the British Museum (Natural History) for calling my attention to the generic name *Fagaropsis* Mildbr. ex Siebenlist, which antedates *Clausenopsis* Engl., and renders the above combination necessary.

**Turraea Fischeri** Guerke in Engl. Bot. Jahrb. **14**, 308 (1819) [Meliaceae], and in Engl. Pflanzenw. Ost-Afr. C, 231 (1895); Harms in Engl. & Prantl, Nat. Pflanzenfam **3**, **4**, 285 (1896); Bak. f. in Journ. Bot. **41**, 11 (1903); Engl. Pflanzenw. Afr. **3**, i, 815 (1915).

TANGANYIKA TERRITORY. Dodoma District. Mpwapwa-Kilosa boundary at the Mafutu River, common in deciduous thicketed valley of seasonal river-bed, especially on rocky parts, c. 1000 m., 15 Aug. 1933, *Burt* 4761:—shrub 3.6 m. high, with masses of cream-coloured flowers. Mpwapwa, Gombo River, frequent at margin of riverine vegetation in semi-desert valley, 750 m., 25 Aug. 1933, *Burt* 4769:—shrub to 3.6 m. high with masses of yellowish green fruits. Mtambi, east of Mpwapwa, in deciduous scrub, 13 July 1933, *Hornby* 558:—small tree, 3.6 m. high. Kondo District. Sambala, on rocks, 1530 m., 12 April 1929, *Burt* 2126:—a shrub to 3 m. high. Manyoni District. Among granite rocks, associated with *Commiphora kyimbilensis* and *Brachystegia filiformis* on kopje at Manyoni, 1200 m., 28 July 1931, *Burt* 3336:—small tree with open habit; flowers very numerous, creamy white, pollinated by green

and yellow honey birds. Manyoni Kopje, locally common, between rocks among granite boulders, 1200 m., 22 July 1933, *Burt* 4970 : — bushy tree 7.5 m. high with great profusion of cream-coloured sweet scented flowers. Shinyanga District. Shinyanga, frequent in thickets on the granite kopjes, 1170 m., 9 June 1931, *Burt* 3300 : — shrub with leaves fallen ; flowers white. In primaeval thickets on granite hills with *Commiphora Eminii*, etc., Beda Road, Shinyanga, 1170 m., May 1935, *Burt* 5128 : — tree, 6 m. high. At foot of granite hills, Shinyanga, 1170 m., 11 Aug. 1935, *Burt* 5129 : — small tree 4.5 m. high, quite leafless, with masses of cream-coloured flowers. Mwanza District. In *Combretum*, *Acacia*, *Albizia* woodland at Nassa Usega, Aug. 1932. *Rounce* 207 : — a deciduous tree.

The ample material of this species in the Kew Herbarium here cited, mainly collected by Mr. B. D. Burt, has recently been compared with fragments of the type specimen of *T. Fischeri* Guerke, which Dr. Harms kindly forwarded to the Imperial Forestry Institute, Oxford. Although variable in a number of characters Mr. Dunkley and I are satisfied that the above material represents but one species. The leaves vary from glabrous or glabrescent with a few scattered hairs on the nerves below to velutinous ; the calyx from sparsely to densely pubescent ; the petals from sparsely to rather densely hirsute ; the appendages of the staminal-tube from sub-entire or minutely bifid to deeply bifid with almost subulate segments ; and the outside of the staminal-tube from glabrous to sparsely hirsute.

E.M.-R.

***Pachystela subverticillata*** E. A. Bruce, sp. nov. [Sapotaceae] ; affinis *P. Msolo* (Engl.) Engl., sed foliis minoribus subverticillatis differt.

*Arbor* cortice viridi-albo, ramulis subteretibus glabris apicem versus dense foliatis. *Folia* stipulata et breviter petiolata, stipulis rigidis angustis subulatis persistentibus petiolum superantibus circiter 6 mm. longis, petiolo brevissimo et crasso cinereo-pubescente ; lamina anguste obovata, 6–9 cm. longa, 2.5–4 cm. lata, apice obtusa vel leviter emarginata, basi anguste cuneata, supra glabra, subtus basi et nervis sparse cinereo-pubescent, demum glabrescent, nervis lateralibus utrinsecus 7–9 subtus prominentibus. *Flores* sessiles, infra folia in axillis ramulorum glomerati. *Calycis lobi* imbricati, exterioribus late ovatis 3 mm. longis 2.5 mm. latis, interioribus angustioribus, omnibus intus glabris extra cinereo-pilosis. *Corolla* rubro-albida, tubo urceolato circiter 3 mm. longo faucem versus angustato 1.5 mm. lato, lobis patentibus ovato-lanceolatis 3-nerviis 5 mm. longis 3 mm. latis apice acutis vel subacutis. *Stamina* exserta, tubo corollae adnata, filamentis (parte libera) 5 mm. longis lobos excedentibus, antheris medio affixis 2 mm. longis. *Ovarium* subglobosum, dense pilosum, 2 mm. longum, stylo 1 cm. longo glabro.

KENYA COLONY. Utwani forest, Dec. 1934, *Abdullah* (For. Dep.

**3344** (type) : —a timber tree with greenish-white bark and reddish-white flowers.

**Tacazzea tomentosa** *E. A. Bruce*, sp. nov. [Asclepiadaceae] ; ab omnibus speciebus floribus majoribus tomentosis, foliis minoribus differt.

*Frutex* scandens, caule tereti striato lenticellato juniore ferrugineo-tomentoso. *Folia* petiolata, petiolo 0.5–1.5 cm. longo gracili ferrugineo-tomentoso ; lamina lanceolata vel ovato-lanceolata, 2.5–4.5 cm. longa, 1–2 cm. lata, apice acuta, basi rotundata, discolor, supra leviter puberula, subtus dense albedo-tomentosa costa media ferruginea, nervis lateralibus utrinsecus 12–16 approximatis. *Inflorescentia* pedunculata, axillaris, cymosa, divaricata, pedunculo 5 mm. longo, ramis cymae circiter 2.5 cm. longis pubescentibus, bracteis lineari-lanceolatis dorso pilosulis membranaceis mox deciduis. *Flores* flavido-albi vel virides, pedicellati, pedicellis circiter 7 mm. longis. *Calyx* parvus, profunde 5-lobatus, lobis triangularibus 1.5 mm. longis acutis tomentosis. *Corolla* dextrorso-contorta, fere usque ad basin 5-partita, lobis reflexis ovatis vel ovato-lanceolatis 4 mm. longis basi 3 mm. latis apice acutis extra tomentosis intus puberulis. *Coronae lobi* 5, filiformes, 3 mm. longi, puberuli, antheris oppositi. *Antherae* ovato-triangulares, 1.5 mm. longae.

UGANDA. Chua District. Agoro, March 1935, *Eggeling* 1704 (For. Dep. 1598) (type) : —a climber over small trees in savannah ; flowers creamy to greenish.

**Raphionacme Vignei** *E. A. Bruce*, sp. nov. [Asclepiadaceae] ; ab omnibus speciebus africanis inflorescentiis densioribus, foliis latioribus obovatis differt

*Herba* perennis, scabrido-puberula, 8–13 cm. alta, basi lignosa, tubere crasso disciformi. *Caules* simplices, erecti, puberuli. *Folia* breviter petiolata, obovata vel oblongo-obovata, apice rotundata minute apiculata, basi cuneata, 4–8 cm. longa, 2–3 cm. lata, supra glaberrima, subtus scabrido-puberula, nervis lateralibus utrinsecus circiter 6 subtus prominentibus. *Inflorescentia* terminalis, congesta, pluricymulosa, cymulis 5–6-floris sessilibus ; pedicelli circiter 1 mm. longi, bracteis parvis lineari-lanceolatis. *Calyx* imbricatus, fere ad basin 5-lobatus, lobis ovatis 1.5 mm. longis acuminatis extra puberulis intus glabris. *Corolla* 5-lobata, lobis ovato-lanceolatis acutis vel subacutis 3.5 mm. longis, tubo breviter campanulato 2 mm. longo. *Coronae lobi* 5, e fauce corollae tubi orti, complanato-filiformes, circiter 5 mm. longi, erecti, simplices. *Antherae* 1.3 mm. longae, ovato-triangulares.

GOLD COAST. Wa, in savannah forest, May 1935, *Vigne* 3823 (type) : —a herb 7–13 cm. high, with a fleshy disc-shaped tuber.

**Ancylanthus rufescens** *E. A. Bruce*, sp. nov. [Rubiaceae] ; affinis



*A. fulgido* Welw. ex Hiern, sed foliis acuminatis nervis tomentoso-rufescentibus, calyce majore lobis obtusis differt.

*Frutex* circiter 2.5 m. altus. *Rami* adscendentes, rigidi, teretes, internodiis usque 6 cm. longis; cortex annotinus dense rufo-tomentosus pilis adpresse adscendentibus, demum plus minusve glabrescens. *Folia* opposita, petiolata, petiolo usque 1 cm. longo dense adpresse rufo-tomentoso; lamina oblongo-obovata, apice abrupte acuminata, basi late cuneata vel rotundata, 7–9 cm. longa et 3–4 cm. lata, superne pilis paucis adpressis costa media densius induta, inferne nervis utrinsecus circiter 7 prominentibus dense rufo-tomentosis, ceterum glabrescens. *Stipulae* circiter 5 mm. longae, subulato-caudatae, basi truncato-connatae, rufo-tomentosae. *Inflorescentiae* erectae, 1–2-florae, axillares, pedunculatae, pedunculis 5–9 cm. longis. *Calyx* profunde 5-lobatus, lobis erecto-patentibus oblongis vel oblanceolatis apice rotundatis circiter 1 cm. longis 4 mm. latis utrinque pilis fuscis sparse indutis, extra costa media prominente densius hirsuta, tubo 3 mm. longo dense rufo-tomentoso. *Corolla* immatura tantum visa, tubo cylindrico amplo 7 mm. longo fauce 5 mm. lato extra rufo-tomentoso intus prope medium pilis reflexis annulato ceterum glabro, lobis lanceolatis 5 mm. longis refractis apice caudato-acuminatis extra rufo-tomentosis intus glabris. *Stamina* 5, ad faucem corollae inserta; antherae lanceolatae, leviter exsertae, filamentis aequilongae. *Stylus* gracilis, glaber; stigma magnum, subcoroniforme. *Ovarium* hemisphaericum, 5-loculare, ovulo solitario pendulo. *Fructus* non visus.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Tanana, in the forest, 1390 m., 3 Febr. 1935, *Miss E. M. Bruce* 765 (type): —shrub 2.75 m. with green flowers, red-brown calyx and handsome red-brown veins on lower leaf-surface.

***Canthium dyscriton* Bullock**, sp. nov. [Rubiaceae]; habitu *C. Greenwayi* Bullock, sed stipulis triangularibus, foliis utrinque rotundatis vel obtusis distincta; inter species seriei floribus fasciculatis gaudentis\* floribus minoribus, stigmate levissime 4-lobo haud bifido facile distinguenda.

*Frutex* parvus, compactus, ramosus, dense foliatus; ramuli pilis persistentibus satis dense ferrugineo-puberuli, subteretes, longitudinaliter striati. *Folia* breviter petiolata, petiolis 1–1.5 mm. longis puberulis; lamina plus minusve coriacea, elliptica vel oblonga, utrinque obtusa vel rotundata, 1–2 cm. longa, 0.5–1.5 cm. lata, supra glabra, nitida, subtus glabra sed pilis paucis ex axillis nervorum (utrinsecus 3) praedita; stipulae triangulares, acutae, subglabrae, marginibus scariosae, 3–4 mm. longae. *Flores* minuti, in fasciculas paucifloras ex axillis foliorum dispositi; pedicelli graciles, glabri, 6 mm. longi. *Calyx* (ovario minutissimo incluso) glaber, dentibus 5 late patentibus triangularibus acutis praeditus. *Corolla* vix 2 mm.

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\*Bullock in Kew Bull. 1932, 353 et seq.

longa, calyce duplo longiora, extra glabra, intus pilis villosis fauce annulata, infra medium in lobos 5 divisa, lobis erectis ovato-oblongis acutis. *Antherae* subtriangulares, apice subacutae, basi truncatae; filamenta satis crassa, brevissima. *Stylus* glaber, basi satis crassus, apicem versus leviter attenuatus, 1 mm. longus, stigmatibus capitato subgloboso brevissime 4-lobis dense papilloso-puberulo. *Drupae* non visae.

KENYA COLONY. Nyatchi district, Teita Hills, 750-1050 m., H. M. Gardner (For. Dep. 3000): — a small shrub, often in compact bushes on wind-swept rocks.

This plant does not easily fit into any of the four series established by the writer\* for the East African species of *Canthium*. The flowers and leaves recall those of *C. Greenwayi* Bullock, but the stipules at once place it in the "Fasciculate Series", where no close affinity can be found. On the whole, it is best placed next to *C. Greenwayi*, in the "Anomalous Series", where it may be regarded as a connecting species between the Anomalous and Fasciculate Series.

***Ixora ulugurensis* Brem., sp. nov.** [Rubiaceae]; a speciebus aliis, quibus corymbi longiuscule pedunculati, pedunculi foliis satis magnis suffulti, flores sessiles vel subsessiles in triades dispositi et bracteolis vix conspicuis muniti proprii sunt, aut foliis minoribus (ab *I. Scheffleri* K. Schum. & K. Krause) aut corolla longiore (ab *I. Albersii* K. Schum. et ab *I. latituba* K. Krause) sat diversa.

*Arbor* ramis foliisque glabris, 6 m. alta. *Rami* graciles, mox cortice griseo-brunneo opaco vestiti. *Folia* petiolata; petiolus 4-8 mm. longus, canaliculatus; lamina tenuiter subcoriacea, oblanceolata, 6-10 cm. longa, 1.8-3.2 cm. lata, apice subacuminata mucronata, basi acuta, in foliis basi pedunculi insertis tamen rotundata, utrinque opaca, siccitate brunnea, costa canaliculata, nervis utroque latere costae 11-13 tenuioribus subtus prominulis, venulis dense reticulatis etiam subtus prominulis. *Stipulae* triangulares, in aristam vagina paulo longiorem exeuntes, axilla dense villosae. *Inflorescentia* glabra ramum ordinarium terminans, longiuscule pedunculata, bis trichotoma, floribus sessilibus in triades 9 dispositis. *Pedunculus* basi foliis brevius petiolatis circiter 5 cm. longis basi rotundatis munitus, 1.2-2.5 cm. longus. *Ramuli inferiores* bracteis subulatis curvatis 3-5 mm. longis suffulti, sicut axis inflorescentiae circiter 1.5 cm. longi; bractee superiores minores; internodia omnia articulata. *Flores* omnes ebracteolati vel interdum bracteolis vix conspicuis ad medium ovarii insertis muniti, basi articulata. *Calyx* glaber, 1 mm. altus, lobis aequilaterialiter triangularibus tubo subaequilongis. *Corolla* extra glabra, tubo 21.5 mm. longo intus glabro, lobis 6-6.5 mm. longis 2-2 mm. latis subacutis. *Filamenta* 1.5 longa; antherae 4 mm. longae, brevissime apiculatae, basi sagittatae in appendices steriles 1 mm. longas exeuntes. *Ovarium* glabrum, turbinatum, 1.4 mm. altum. *Stylus* glaber, parte exserta stigmatibus comprehensis 3 mm. longa.

\*Kew Bull. 1932, 353 et seq.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Tanana, Matomba Point, occasional, 1700–1800 m., Feb. 1935, *Miss E. M. Bruce* 804 (type):—flowers red and white, sweet scented; native name *sabibu*.

The corolla lobes are doubtless white, the ovary and calyx and perhaps part of the corolla tube red. Of the species mentioned above *I. latituba* comes probably nearest to our new one: in their vegetative parts the two species are almost indistinguishable. The corolla tube of *I. latituba* however is stouter and shorter and the lobes are longer.

***Lasianthus cereiflorus* E. A. Bruce**, sp. nov. [Rubiaceae]; affinis *L. glomerulifloro* K. Schum, sed foliis anguste cuneatis infra pallidis, petiolis longioribus, floribus majoribus differt.

*Frutex* 2.5–5 m. altus. *Ramuli* subteretes vel leviter tetragoni, pallidi, internodiis 4–5 cm. longis glabris. *Folia* opposita, petiolata, petiolo 1–2 cm. longo; lamina oblongo vel elongato-obovata, 10–22 cm. longa, 3–7 cm. lata, apice subacuta vel breviter obtuse acuminata, basi anguste cuneata (nonnunquam inaequaliter), utrinque glabra, subtus pallidiora, nervis lateralibus utrinsecus 9–11 arcuatis. *Stipulae* parvae, triangulari-ovatae, apice obtusae, circiter 3 mm. longae. *Flores* plurimi, axillares, sessiles, dense glomerati. *Calyx* 3-lobatus, glabrescens vel pauce puberulus, lobis subquadratis emarginatis 1 mm. longis 2 mm. latis, tubo 3 mm. longo. *Corolla* lilacina, cerea, tubo leviter curvato 1.2–1.4 cm. longo fauce 3 mm. lato extra glabrescente intus hirsuto, lobis 6 lineari-lanceolatis 4 mm. longis apice acutis extra glabrescentibus intus leviter hirsutis. *Stamina* 6, fauce inserta, leviter exserta; antherae oblongae, 2 mm. longae, filamentis brevissimis. *Ovarium* depresso subglobosum, 6-loculare, stylo gracili 1.2 cm. longo, stigmatibus 6-lobulato.

TANGANYIKA TERRITORY. Morogoro District. In forest, Uluguru Mts., 1600 m., 17 Nov. 1934, *Miss E. M. Bruce* 140 (type):—2.5 m. shrub with striking mauve waxy flowers. Without locality, 1500 m., *Wallace* 438. Without locality, 1700 m., *Brandenburg* 277. N. W. Uluguru Mts., 1380 m., *Schlieben* 2757:—shrub 5 m. high.

***Lasianthus pedunculatus* E. A. Bruce**, sp. nov. [Rubiaceae]; affinis *L. macrocalyci* K. Schum., sed foliis minoribus, pedunculis longioribus gracilibus differt.

*Frutex* 2–3 m. altus. *Ramuli* subteretes, striati, glabri, lenticellati, internodiis 3–4.5 cm. longis. *Folia* opposita, petiolata, petiolo gracili 5–10 mm. longo; lamina anguste ovata vel elliptico-lanceolata, 8–13 cm. longa, 4–5 cm. lata, apice acuta, subacuta vel leviter acuminata, basi cuneata, utrinque glabra, nervis lateralibus utrinsecus circiter 10 arcuatis subtus prominentibus. *Stipulae* parvae, triangulares, subacutae, circiter 1 mm. longae. *Inflorescentiae* pedunculatae, pedunculis 2 axillaribus 2–3 cm. longis, floribus spicatis

pendulis, apice circiter 2-6 conglomeratis. *Calyx* 2-lobatus, lobis ovato-orbiculatis glabris circiter 4 mm. longis et latis apice rotundatis, tubo turbinato 2 mm. longo. *Corolla* lilacina, glabrescens, tubo cylindrico 9-12 mm. longo 3 mm. lato intus hirsuto, lobis 5 ovato-lanceolatis 2-3 mm. longis apice acutis hirsutis. *Stamina* 5, fauce inserta; antherae oblongae, 2 mm. longae. *Ovarium* turbinatum, 5-loculare, stylo circiter 5 mm. longo apice 5-lobato.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Bondwa, in forest, 2000-2300 m., 23 April 1935, *Miss E. M. Bruce* 1096 (type):—a shrub 2-3 m. high with mauve pendulous flowers.

***Lasianthus Wallacei* E. A. Bruce**, sp. nov. [Rubiaceae]; affinis *L. microcalyci* K. Schum., sed floribus paucis majoribus, calyce majore, fructu juniore hirsuto differt.

*Frutex* vel *arbor* 3-18 m. alta. *Ramuli* subteretes, apicem versus complanati, nigrescentes, sparse lenticellati, glabri, internodiis 4-7 cm. longis. *Folia* opposita, coriacea, petiolata, petiolo 5-10 mm. longo; lamina oblonga vel anguste obovata, 13-17 cm. longa, 4-7 cm. lata, apice obtusa, subacuta vel abrupte et breviter obtuse acuminata, basi cuneata, supra glabra, subtus nervis apicem versus sparse pilosa, nervis lateralibus utrinsecus 12-14 arcuatis subtus prominentibus. *Stipulae* triangulares, circiter 4 mm. longae, coriaceae, margine hirsutae. *Flores* 1-3, axillares, subsessiles. *Calyx* (in fructu immaturo) fere usque ad basin 3-4-lobatus, lobis ovato-ellipticis apice obtusis circiter 10 mm. longis 7 mm. latis, extra pilis ferrugineis sparse apice densius indutis intus glabris, tubo ovario adhaerente 6-8 mm. longo ferrugineo-hirsuto. *Corolla* non visa, fide lectorum alba usque profunde violacea. *Ovarium* 3-6-loculare.

TANGANYIKA TERRITORY. Morogoro District. Without locality, in forest, 1700 m., *Wallace* 491 (type):—a timber tree 18 m. high with deep violet petals and intense blue fruits. Uluguru Mts., 1650 m., *Schlieben* 2838:—small tree 6-8 m. high, flowers waxy white. Uluguru Mts., Lukwangule, 1850 m., 5 April 1935, *Miss E. M. Bruce* 978:—shrub 3-4.5 m. high with large mauve blossoms and thick leaves; native name *mgemamondo* (Kiswahili).

***Pavetta Bruceana* Brem.**, sp. nov. [Rubiaceae]; ad sectionem *Dolichosiphon*, seriem *Dentatae* pertinens et *P. Elliottii* K. Schum. & K. Krause et *P. olivaceo-nigrae* K. Schum. approximans, *P. Elliottii* foliis obovatis majoribus subtus nervis solis tomentosis, floribus multo minoribus, a *P. olivaceo-nigra* ramis floriferis viridibus, stipulis longiuscule vaginatis haud aristatis, calyce brevius dentato sat diversa.

*Frutex* 1.2-1.8 m. altus. *Rami novelli* dense et molliter pubescentes, vetustiores cortice griseo opaco vestiti. *Folia* breviter petiolata; petiolus dense pubescens, supra concavus, 5-8 mm. longus; lamina herbacea, plerumque obovata, 6.5-13 cm. longa,

2-4.7 cm. lata, apicem versus plerumque leviter contracta vel interdum caudato-acuminata, mucronata, basi acuta vel cuneata, utrinque opaca et pubescens, siccitate nigrescens, nervis utroque latere costae 8-9 subtus prominulis et sicut costa nodulique tomentosis. *Stipulae* longiuscule vaginatae, 1.5 cm. longae, scariosae, apice cuspidatae, axilla sericeo-villosae. *Rami floriferi* axillares, oppositi, virides, dense pubescentes, foliis plus quam dimidio breviores, jugo unico vel duobus jugis foliorum 4 cm. haud superantium coronati. *Inflorescentia* contracta, hemisphaerica, floribus 20-30, dense pubescens. *Calyx* sparse pilosus, tubo 1 mm. longo, dentibus 3-5 mm. longis. *Corollae tubus* 11 mm. longus, extra glaber, intus densius pilosus, lobis 6 mm. longis. *Ovarium* subtomentosum, globosum, 1.3 mm. altum. *Stylus* 2.8-3.0 cm. longus.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Lukwangule, occasional in forest girdling the summit, 2100-2400 m., 30 Jan. 1935, *Miss E. M. Bruce* 704 (type): —shrub 1-2 m. high; flowers white.

The green flowering shoots are an abnormal feature in this section, and if I had not found them occasionally in *P. Elliottii* also, I would probably have made a new section for this plant. Its affinity with other species of the section, especially with the members of the series *Dentatae*, however, is so unmistakable, that the creation of a new section appears unnecessary.

***Pavetta constipulata* Brem., sp. nov.** [Rubiaceae]; *P. Galpini* Brem. proxima, habitu tamen fruticoso, stipulis in spatham obliquam apice biaristatam cohaerentibus, calycis lobis angustissime triangularibus facilliter recognoscenda.

*Frutex* 1.8-2.4 m. altus, ramis foliisque glabrescentibus. *Rami* foliis nudati cortice flavido-brunneo nitido vestiti. *Folia* petiolata; petiolus supra concavus, usque ad 1 cm. longus, a lamina haud distincte sejunctus; lamina herbacea oblanceolata, 12-18 cm. longa, 4-5.5 cm. lata, apicem acutissimum versus caudato-acuminata, basi cuneata et sensim in petiolum decurrens, primum subtus scabridula, mox glabrescens, utrinque nitidula vel subopaca, siccitate brunnescens, foliorum novellorum tamen nigrescens, domatiis parvis fauce pilosis paucis, nodulis orbicularibus parvis numerosis, nervis utroque latere costae 10-11 supra canaliculatis subtus prominulis. *Stipulae* in spatham obliquam circiter 1 cm. longam apice aristis duabis coranatum cohaerentes, axilla sericeo-villosae. *Rami floriferi* basi abrupte recurvati, horizontaliter patentes vel subpenduli, 6-12.5 cm. longi, internodio unico formati, interdum internodio longo internodio brevissimo sub stipulis abscondito secuto, jugo unico vel interdum jugis duobus foliorum plerumque 4.5-7 cm. longorum stipulis normaliter inter se separantibus munitorum coronati. *Inflorescentia* breviter pubescens, laxe corymbosa, axi efoliata et ramulis 1.5-2 cm. longis, floribus circiter 45. *Ovarium calyxque* breviter pubescentes. *Calyx* tubo 0.8 mm. longo lobis

angustissime triangularibus 3·7 mm. longis basi 1·2 mm. latis instructus. *Corolla* extra glabra, tubo 16 mm. longo 2 mm. diametro intus piloso, lobis 6 mm. longis 2·5 mm. latis apice viridi-mucronatis. *Ovarium* ovoideum, 1·5 mm. altum. *Stylus* 3·6 cm. longus.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Morogoro, Morningside, occasional in forest, 1350 m., 28 Nov. 1934, *Miss E. M. Bruce* 228 (type):—shrub 2 m. high; flowers white; native name *mtambwala*. Without locality, 1350 m., 23 Nov. 1932, *Wallace* 478:—shrub 2·5 m. high; corolla, in bud, cream with green tips, native name *lusigisi* (Kiswahili).

The relationship between this species and *P. Galpini* cannot be doubted. For its inclusion in the section *Chloropus*,\* of which *P. Galpini* was so far the only representative, the definition of this section will have to be changed somewhat. Instead of "calyx crenatus" one should read "calyx crenatus vel lobatus" and instead of "inflorescentiae superiores axillares" "inflorescentiae superiores interdum axillares".

***Pavetta filistipulata* Brem., sp. nov.** [Rubiaceae]; ad sectionem *Trichosphaeram* pertinens, ab speciebus aliis huius sectionis (*P. rufipila* Brem., *P. sansibarica* K. Schum. et *P. trichosphaera* Brem.) stipulis in aristam plus quam 1 cm. longam exeuntibus et calycis lobis plus quam 6 mm. longis facilius distinguenda, indumento griseo, inflorescentia corymbosa et corolla extra pilosa *P. sansibaricae* et *P. trichosphaerae* approximans.

*Frutex* 1·8 m. altus, ramis novellis petiolisque indumento griseo vestitis. *Rami vetustiores* cortice albido opaco obtecti. *Folia* petiolata; petioli 1–1·5 cm. longus; lamina herbacea, oblanceolata vel anguste obovata, 9–16 cm. longa, 3–5·5 cm. lata, apice acuminata, basi acuta vel cuneata, utrinque opaca et pilis sparsis vestita, siccitate brunnescens, nervis utroque latere costae 7–9 subtus prominulis et sicut costa indumento griseo vestitis, nodulis paucis praesertim ad costam adjicientibus haud parvis. *Stipulae* vagina late triangulari vel subtruncata circiter 3·5 mm. longa et arista circiter 12 mm. longa compositae. *Rami floriferi* internodio unico 12–14 cm. longo interdum internodio altero 0·5–1·5 cm. longo secuto formati, jugo unico vel interdum duobus jugis foliorum magnitudine paulo redactorum post anthesin persistentium coronati. *Inflorescentia* pubescens, corymbosa, ramulis 1·5–2 cm. longis, floribus circiter 45. *Calycis* lobi 6·5 mm. longi. *Corolla* extra plus minusve dense pilosa, tubo intus glabro, dimensionibus ob florum immaturitatem haud certe determinandis. *Ovarium* indumento griseo denso vestitum. *Drupa* globosa, densius pubescens, circiter 7 mm. diametro, calyce coronata.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Morogoro, Morningside, occasional in forest, 1500 m., 20 April 1935, *Miss*

\*Fedde, Rep. Sp. Nov. 37. 28 (1934).

*E. M. Bruce* 1120 (type):—shrub 2 m. high, in fruit. Without locality. in forest, 1350 m., 21 Nov. 1932, *Wallace* 472:—shrub 2 m. high, in bud; native name *vutavuta* (Kiswahili).

***Pavetta* sectio 16a *Gerontopus* Brem., sect. nov.**

*Frutex* sparse hirtellus. *Folia* opposita, breviter petiolata, domatiis nullis, nodulis sparsis. *Stipulae* axilla sericeo-villosae. *Rami floriferi* pedunculiformes, sub anthesi cortice secundo vestiti. *Inflorescentia* corymbosa. *Calycis lobi* anguste triangulares. *Corollae tubus* intus sparse pilosus. *Ovula* solitaria.—Typus *P. sparsipila* Brem., sp. nov.

Hab. Africam orientalem tropicalem.

***Pavetta sparsipila* Brem., sp. nov. [Rubiaceae]; typus sectionis novae *Gerontopodis*.**

*Frutex* sparse hirtellus, 1.8 m. altus. *Rami* graciles, mox cortice griseo-brunneo opaco desquamante vestiti. *Folia* breviter petiolata; petiolus circiter 5–8 mm. longus, a lamina haud distincte sejunctus, supra concavus; lamina herbacea, obovata, 7–11 cm. longa, 2.8–4.4 cm. lata, apice caudato-acuminata, mucronulata, basi cuneata et sensim in petiolum exiens, supra nitidula, subtus opaca, utrinque sed praesertim facie inferiore costae et nervorum pilis sparsis hirtella, siccitate saturate olivacea, nervis utroque latere costae 7–10 utrinque prominulis. *Stipulae* 6 mm. longae, costa viridi, utroque latere costae hyalinae, in aristam 1.5 mm. longam exeuntes. *Rami floriferi* 4–9 cm. longi, plerumque internodio unico formati, foliis 4 cm. longis ante anthesin deciduis coronati. *Inflorescentia* dense pubescens, haud laxa corymbosa, ramulis 1 cm. vix superantibus, floribus circiter 75. *Ovarium calyxque* dense pubescentes. *Calycis tubus* 1 mm. altus, lobis anguste triangularibus 6 mm. longis basi 1 mm. latis. *Corollae tubus* 14 mm. longus, 1 mm. diametro, lobis oblongis 6 mm. longis 2 mm. latis. *Ovarium* turbinatum, 1 mm. altum. *Stylus* 38 mm. longus.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts. Bunduki, quite frequent in forest, 1200 m., 8 Jan. 1935, *Miss E. M. Bruce* 437 (type):—shrub, 2 m. high; flowers white; native name *mlengolengo*.

The new section differs from the section *Crinita*, which it resembles in the character of the flowering shoot, in the structure of the calyx and in the distribution of the nodules; the latter are scattered over the whole surface of the leaf, as in *Monanthus* and *Brachypus*. From these two sections it differs in the length of the flowering shoots, from *Monanthus* moreover in the many-flowered inflorescence and from *Brachypus* in the long calyx lobes.

***Tarenna quadrangularis* Brem., sp. nov. [Rubiaceae]; *T. congensi* Hiern proxima, sed ramis acute quadrangularibus, stylo griseo-pubescente, tubo corollae longiore, folii apice caudatis sat diversa.**

*Frutex* 1·8 m. altus, ramis foliisque glabris. *Rami novelli* nitiduli, quadrangulares et anguste alati. *Folia* longiuscule petiolata; petiolus gracilis, 1–2 cm longus, canaliculatus; lamina chartacea, oblanceolata, 10–12 cm. longa, 3–4·6 cm. lata, apice in caudam linearem obtusam 1·5–2 cm. longam exiens, basi acuta vel cuneata, utrinque glaberrima et nitidula, domatiis solis in axillis et ramificationibus nervorum dispositis ore pilosis, siccitate brunnescens, costa canaliculata, nervis utroque latere costae 7–8 subtus prominentibus. *Stipulae* late ovatae, breviter acuminatae vel cuspidatae, intus dense pilosae. *Inflorescentiae* glabrae, ramulos graciles internodio circiter 8 cm. longo formatos foliis magnitudine paulo redactis coronatos terminantes, pedunculo circiter 3·5 cm. longo internodio praecedenti persimili munitae, ramulis inferioribus circiter 2·5 cm. longis foliis duobus suffultis altero praecedentibus persimili altero multo minore 1–2 cm. longo, floribus 15 in triades 5 dispositis, pedicellis 8–10 mm. longis. *Pedicelli* florum triadis lateralium medio bracteolis 0·6 mm. longis muniti. *Calyx* glaber, tubo 0·6 mm. longo, lobis late quadrangularibus breviter acuminatis eodem sensu ac corolla contortis tubo aequilongis. *Corolla* tubo 6 mm. longo extra glabro intus pubescente, lobis acuminatis 7 mm. longis 3 mm. latis instructa. *Filamenta* 1·3 mm., antherae 6·5 mm. longae. *Ovarium* glabrum, ovoideum, 1·5 mm. altum, ovulis in quoque loculo 5. *Stylus* 1·45 cm. longus, parte inclusa griseo-pubescente.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Morogoro, Kisaki Road, abundant in forest, 1500 m., 18 Dec. 1934, *Miss E. M. Bruce* 317 (type):—shrub 2 m. high; flowers white; native name *mfiro*.

Besides *Tarenna congestis* this species also shows points of resemblance with *T. pavettoïdes* (Harv.) Sim and with *T. Friesiorum* (K. Krause) Brem., from both of which it differs conspicuously in the size and shape of the leaves.

The presence of domatia not only along the midrib but also along the primary nerves is a feature worth mentioning, as domatia are by no means common in this genus. The contorted aestivation of the calyx lobes, described already by Hiern in one or two other species of this genus, deserves attention, because it is often thought that this kind of aestivation does not occur in the calyx.

***Tricalysia anomala* E. A. Bruce, sp. nov.** [Rubiaceae]; affinis *T. Welwitschii* K. Schum., sed floribus paucis majoribus hexameris differt.

*Frutex* 4–5 m. altus, ramis subteretibus superne complanatis tomentosis, nodis crassis 4–5 cm. distantibus. *Folia* breviter petiolata, petiolo circiter 6 mm. longo tomentoso; lamina oblonga vel elliptico-obovata, apice acuta vel acuminata, acumine acutissimo, basi rotundata vel late cuneata, 13–18 cm. longa, 5–7 cm. lata, supra glabra costa media tomentella, subtus nervis pubescentibus ceterum



glabra, nervis lateralibus utrinsecus 10–12 supra impressis subtus prominentibus. *Stipulae* basi late triangulares vel ovato-triangulares, apice caudatae, usque 1 cm. longae, hirsutae. *Cymae* 2–3-florae, axillares, subsessiles, floribus breviter pedicellatis. *Bracteae* linearilanceolatae, basi connatae, bracteoleis 2 subulatis 4 mm. longis liberis. *Calyx* profunde 6-lobatus, lobis subulatis circiter 6 mm. longis hirsutis, tubo anguste campanulato 6 mm. longo hirsuto basi densiore flavido-hirsuto intus adpresse sericeo. *Corolla* alba, 6-lobata, lobis contortis tubo longioribus linearilanceolatis 1.2 cm. longis 3 mm. latis apice acuminatis utrinque griseo-tomentosis, tubo 1 cm. longo basi 1.5 mm. fauce dilatato 3 mm. lato extra leviter pubescente intus glabro fauce hirsuto. *Stamina* fauce inserta, e corolla exserta, filamentis circiter 5 mm. longis glabris, antheris linearibus 7 mm. longis exappendiculatis. *Ovarium* subturbيناتum, 2-loculare, 3 mm. longum, ovulis in quoque loculo 6 vel pluribus, stylo gracili pubescente circiter 2 cm. longo apice bifido, lobis 5 mm. longis. *Fructus* subglobosus, hirsutus, circiter 1.5 cm. longus, 1.3 cm. latus, calyce apice persistente.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Tanana, in forest, 1380 m., 7 Febr. 1935, *Miss E. M. Bruce* 800 (type) : —a shrub 4–5 m. high.

***Linnaeopsis gracilis* E. A. Bruce**, sp. nov. [Gesneriaceae] ; affinis *L. Heckmannianae* Engl., sed foliis majoribus haud cordatis, calycis lobis angustioribus differt.

*Herba* repens, circiter 15 cm. alta, caulibus pilosis leviter complanatis radicibus adventitiis leviter instructis, nodis 3–4 cm. distantibus. *Folia* alterna, longe petiolata, petiolo gracili complanato leviter piloso 2–3.5 cm. longo ; lamina oblongo-orbiculata vel orbiculata, 3–4 cm. longa, 2.5–3.5 cm. lata, apice rotundata vel truncata, basi truncata vel late cuneata, margine crenata, supra pilis paucis adpressis, subtus nervis pilis adpressis instructa, ceterum minute scabridula, nervis lateralibus utrinque 6–8. *Inflorescentia* axillaris, pedunculata, pedunculo gracili piloso 6–10 cm. longo ; cymae circiter 4–9-florae, floribus longe pedicellatis, pedicellis circiter 1 cm. longis. *Calyx* fere usque basin inaequaliter 5-partitus, lobis anguste oblongis 3–4 mm. longis basi 0.5–1 mm. latis apice obtusis vel truncatis pilis paucis ornatis. *Corolla* alba, oblique campanulata, pubescens, tubo 5 mm. longo basi 3 mm. fauce 8 mm. lato, lobis semiovatis, posticis 2 minoribus, lateralibus 3 mm. longis 3.5 mm. latis apice rotundatis. *Stamina* basi corollae adnata, 2 antica fertilia, filamentis 3 mm. longis, antheris reniformibus 2 mm. longis. *Ovarium* glabrum, oblongo-ovoideum, in stylum 4 mm. longum attenuatum, stigmate integro, disco annulari obliquo antice paulo latiore.

TANGANYIKA TERRITORY. Morogoro District. Uluguru Mts., Tanana, Matombo Road, in forest, 2000 m., Febr. 1935, *Miss E. M. Bruce* 802 (type) : —a recumbent herb with white flowers.

**Anisotes dumosus** *Milne-Redhead*, sp. nov. [Acanthaceae]; *A. ukambensi* Lindau affinis, sed bracteis tomentosis, calyce minore lobis brevioribus differt.

*Frutex* usque 2 m. altus, dense ramosus, praecox. *Rami* rigidi, crassi, teretes, glabri, internodiis brevibus. *Folia* ovato-elliptica vel late lanceolata, apice attenuata, vix acuminata, basi in petiolum usque 5 mm. longum angustata, circiter 13 cm. longa et 4 cm. lata, utrinque glabra; nervi utrinque conspicui, laterales utroque latere costae 6-9. *Inflorescentiae* axillares, brevissimae, usque 3-florae; bractae ovatae, subacutae, vix 2 mm. longae, extra dense tomentosae, intus glabrae. *Calyx* 5-lobatus, circiter 4 mm. longus, lobis lanceolatis circiter 2.5 mm. longis, extra parce hirsutus et dense minuteque glandulosus, intus plus minusve glaber. *Corolla* bilabiata, luteo-alba, extra densiuscule glandulosa, intus glabra, circiter 4.5 cm. longa; tubus inferne cylindricus, circiter 4 mm. diametro, basi glaber, postice infra medium in saccos duo externos breves vix 1 mm. latos excavatus, antice infra faucem in saccum externum callum triangularem internum efformantem excavatus; tubus superne leviter compressus, ut labium posticum arcuatus; labium posticum integrum, oblongo-lanceolatum, circiter 3.5 cm. longum, leviter arcuatum, concavum, apice obtusum; labium anticum latissime liguliforme, plus minusve reflexum, circiter 3.5 cm. longum, trilobatum, lobis usque 1 cm. longis, medio apice cuculato lateralibus latiore. Stamina 2, postica, apicem versus tubi affixa; filamenta compressa, circiter 3 cm. longa; antherae dithecae, thecis discretis 4.5 mm. longis, altera paullo altius affixa, inferiore basi calcarata. *Discus* cupularis, 1 mm. altus. *Ovarium* circiter 3 mm. longum, glabrum; stylus circiter 3.8 cm. longus, glaber, apice integer. *Capsula* stipitata, clavata, apice brevissime rostrata, circiter 2.5 cm. longa, glabra. *Semina* 4, plano-compressa, suborbicularia, leviter rugosa.

TANGANYIKA TERRITORY. Shinyanga District. On poor hard-pan soils and termite mounds, Mahumbu River Flats, Shinyanga, 1200 m., July 1935, *Burt* 5144 (type):—a very common coppicing shrub 1-2 m. high; flowers creamy white, appearing when the shrub is leafless. On decayed granite soils and alluvial mud flats of the Mnyonga River, 1100 m., 27 June 1931, *Burt* 3438:—a very common semi-evergreen shrub up to 2 m. high; foliage dark green, falling in June; flowers in masses on the leafless shrub, creamy white, much sought after by honey birds. On saline alluvial old lake deposits with *Acacia spirocarpa* Hochst. ex A. Rich., *A. Orfota* (Forsk.) Schweinf. and *Cissus quadrangularis* L. at Sakamalewa village in the Wembare region, c. 1050 m., Oct. 1935, *Burt* 5303:—a coppicing shrub, 2 m. high, now leafless, but with great quantities of fruits; gregarious and common; seen also at Sekenke gold mine. Chisukuma name *msagara*.

Beautiful material of this species has recently been received from Mr. B. D. Burt who writes of it as follows:—“It is a feature of the

Nsukuma country, i.e. the vast areas of old lake deposits south of Lake Victoria. This country is overpopulated by the Wasukuma tribe and is now largely open cultivation steppe. This peculiar *Anisotes* is extremely abundant and becomes a feature of the landscape as it is a thick dark-green-leaved coppicing shrub usually about 1.2 m. high. The leaves are shunned by cattle, sheep and goats, and are not shed until well on into the dry season. Almost as soon as the leaves fall the flowers appear, and give the bushes a pale greenish-white appearance because of their masses. The flowers are soon replaced by very numerous green fruits which on ripening turn brown. It is an important constituent of the alluvial thickets, the habitat of the tsetse-fly, *Glossina swynnertonii*, which utilizes those thickets for the pupa sites. When found in thickets, the plant is associated with *Commiphora Schimperii* Engl., *C. sarandensis* B.D. Burt, *C. Stuhlmannii* Engl., *C. subsessilifolia* Engl., *Grewia bicolor* Juss., *Grewia praecox* K. Schum., *Combretum parvifolium* Dinter, *Albizzia Harveyi* Fourn. and sometimes *Acacia drepanolobium* Harms."

**Justicia salvioides** Milne-Redhead, nom. nov. [Acanthaceae]. *Duvernoia salviiflora* Lindau in Engl. Jahrb. **20**, 42 (1894); Engl. Prantl, Pflanzenfam. **4**, 3B, 339 (1895); Engl. Pflanzenw. Ost-Afr. C, 372 (1895). *Justicia salviiflora* (Lindau) C.B.Cl. in Dyer Fl. Trop. Afr. **5**, 205 (1900), non H.B.K. (1817).

**Kniphofia (Laxiflorae) Rogersii** E. A. Bruce, sp. nov. [Liliaceae]; affinis *K. Thomsoni* Bak., sed bracteis minoribus, foliis majoribus, inflorescentia densiore differt.

*Herba* perennis, erecta, rhizomatosa. *Folia* pauca, rosulata, linearia, glabra, sensim acuminata, 40–60 cm. longa, basi 2 cm. lata, 18–22-nervia, costa media valde carinata, utrinque sparse papilloso-scabridula, margine papillosa. *Scapus* terminalis, circiter 70 cm. altus, lenticellatus, basi nudus, 1 cm. diametro, glaber, superne tantum bracteatus. *Racemus* 20–25 cm. longus, floribus pendulis basi laxe superne densius dispositis. *Bracteae* triangulari-ovatae, tenuiter acuminatae, 3–4 mm. longae, membranaceae; pedicelli brevissimi, persistentes, deflexi, basi calycis disarticulati, 3–4 mm. longi. *Perianthium* glabrum, flammum, 3–3.5 cm. longum, cylindraceum, basi leviter inflatum, supra ovarium constrictum, tubo stricto 5-striato fauce 6–7 mm. diametro, lobis parvis 2 mm. longis ovatis obtusis subaequalibus. *Antherae* inclusae vel leviter exsertae. *Ovarium* ovoideo-conicum, stylo demum breviter exserto. *Capsula* fere globosa, 9 mm. diametro, valvis transverse venosis. *Semina* compressa trigona, margine alata.

KENYA COLONY. Aberdare Mts., in swampy ground among high grass in bamboo forest, Gambini Swamp, 2660 m., 6 Aug. 1933, Gilbert Rogers s.n. (type): —flowers vermilion and yellow, comparatively few in a head, drooping. In swampy land at Molo, 2460 m., R. M. Graham 2799. In swamp, Limuru, 2150 m., van

*Somerens* (Coryndon Museum 5193):—an erect herb about 2 m. high. Loreko, 3080 m., *Napier* 1344:—herb 1-1.6 m. high.

The above description was made from the dried specimen originally collected by Mr. C. Gilbert Rogers in the Aberdare Mts. Mr. Rogers has also kindly sent specimens of plants raised from seed, both out-of-doors and in a cool greenhouse. These show slight differences in size and flower colour from the original. The plant appears to vary in height from 3-6 ft.

***Anthericum suffruticosum* (Bak.) Milne-Redhead**, comb. nov. [Liliaceae]. *Chlorophytum suffruticosum* Bak. in Journ. Bot. 16, 326 (1878); and in Dyer, Fl. Trop. Afr. 7, 508 (1893). *Chlorophytum rhizomatosum* Bak. in Gard. Chron. ser. 2, 24, 230 (1885) and in Dyer, Fl. Trop. Afr. 7, 508 (1898); Engl. Pflanzenw. Ost-Afr. C. 140 (1895). *Anthericum campestre* Engl. Pflanzenw. Ost-Afr. C. 138 (1895); Bak. in Dyer Fl. Trop. Afr. 7, 483 (1898). *Dasystachys polyphylla* Bak. in Dyer Fl. Trop. Afr. 7, 511 (1898).

KENYA COLONY. Nyika Country near Mombasa, *Wakefield* s.n. (type). On coral rocks at Mombasa, 5 June 1934, *Napier* (Coryndon Museum 6361):—a curious herb with bare rough stems, and a tuft of leaves at the apex; flowers green and white. Rabai, Mombasa, Jan. 1886, *W. E. Taylor* s.n. (British Museum).

TANGANYIKA TERRITORY. Kilimanjaro, 1500 m. [probably between Kilimanjaro and the coast], *Johnston* s.n. (type of *Dasystachys polyphylla* Bak.). Tanga, Febr. 1893, *Volkens* 190 (type of *Anthericum campestre* Engl.). Sigi Sigoma, 270 m., April 1935, *Bally* s.n. in Herb. Amani:—perennial herb with white flowers; stems fleshy, 2.5 cm. thick and nearly 2 m. long, procumbent over rocks. Sigi Sigoma, rare, in damp situations among humus on very large rock exposures, 270 m., 24 April 1935, *Greenway* 4043:—perennial herb with greenish-white flowers on stalks up to 3 dm. tall; stems 2.5 cm. thick, and nearly 2 m. long, procumbent on rocks; leaves fleshy, grasslike, up to 3 dm. long; juice of leaves used by women for tattooing; root used in a fresh state as an aphrodisiac. Kishamb name *kilambito*.

CULTIVATED. Hort. Kew., Aug. 1885, received from Sir John Kirk, and said to come from Zanzibar (type of *Chlorophytum rhizomatosum* Bak.). [This plant may have come from the mainland opposite Zanzibar].

Excellent material of this remarkable species both in flower and fruit has recently been received at Kew from Mr. P. J. Greenway. The capsules and seed show that Engler was right in placing the plant in *Anthericum*, but Baker's original epithet *suffruticosum* must replace Engler's *campestre*. The synonymy is surprisingly large for such a distinct species. As will be seen from the field notes, the woody rhizomes up to six feet long grow exposed on the surface of bare rocks, a habit apparently unique in this genus.

**XLVI—DECADES KEWENSES PLANTARUM NOVARUM IN  
HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXXII.**

**1311. *Draba cuzcoënsis* O. E. Schulz** [Cruciferae-Alyssineae]; juxta *D. discoideam* Wedd. ponenda, a qua glandulis nectariferis singularibus, racemis fructiferis laxis, siliculis acutis differt.

*Herba* pumila perennans, florifera 3–7 cm., fructifera usque ad 12 cm. alta. *Radix* primaria descendens, ramosa, multiceps; caudicis rami conferti, breves, inferne petiolis foliorum emortuorum persistentibus emarcidis albidis nitentibus linearibus usque 10 mm. longis 1–1.5 mm. latis dense squamati, superne folia rosulata ferentes et caespitem densum 1.5–4 cm. latum formantes. *Caules* nonnulli (1–3) simplices, 0.5–1 mm. crassi, parce foliosi, pilis stipitato-bifurcis et ramosis raris simplicibus usque ad sepala (incl.) hirti. *Folia* basalia oblongo-ovata, apice obtusiuscula, integra, basin versus in petiolum brevem angustata, 1–2.5 cm. longa, superne 0.25–0.5 cm. lata; caulina sessilia, minora, pauca tantum, ovata, summa linearia; omnia pilis simplicibus usque 0.75 mm. et brevioribus ramosis utrinque hispida et ciliata. Racemus initio capitato-confertus, dein elongatus, 10–20-florus, inferne saepe bracteatus. *Pedicelli* 5–2 mm. longi. *Flores* minuti. *Sepala* 2 mm. longa, exteriora late oblonga, interiora latissime ovata, omnia apice rotundata, late hyalino-marginata, dorso hispida. *Petala* flava, 3.2 mm. longa, oblongo-ovata, apice minute emarginata, paucivenosa. *Stamina* 2–2.2 mm. longa, filamenta basin versus dentiformiter dilatata; antherae breviter ovoideae, fere 1 mm. longae. *Glandulae* nectariferae laterales binae, majusculae, triangulares, ad lineam mediam elongatae. *Pistillum* anguste ampullaceum; ovarium ovulis 18, glabrum; stylus conicus, brevis; stigma punctiforme. *Siliculae* in pedicellis 8–6 mm. longis adscendentibus continuae, oblongo-ellipsoideae, compressae, 6–9 mm. longae, 3 mm. latae, apice acuto stylo 0.5 mm. longo coronatae, valvis glabris, nervo medio percursis, obscure viridibus vel nigro-violaceis; septum completum. *Semina* ovoidea, 1 mm. longa ad 0.75 mm. lata, brunnea, testa tuberculata.

PERU. Dept. Cuzco: near Cuzco, alt. 4000 m., *Dora B. Stafford* 264: “flowers yellow”.

**1312. *Ceropegia Stentiae* E. A. Bruce** [Asclepiadaceae]; affinis *C. Barklyi* Hk. f. sed foliis linearibus, corollae lobis longioribus, tubo valde incurvo, coronae lobis interioribus linearibus angustioribus longioribus differt.

*Herba* perennis, erecta, simplex, vel supra basin ramosa, 8–12 cm. alta, tubere ellipsoideo 2 cm. longo 3 cm. lato. *Caules* striati, sparse puberuli, maturi demum glabri, dense foliati, internodiis circiter 5 mm. longis. *Folia* erecto-patentia, subsessilia, anguste linearia, glabra, acuta, basi cuneata, 4–6 cm. longa, 2–3 mm. lata, margine revoluta. *Flores* axillares, solitarii, pedicellis circiter 1 cm. longis glabris vel sparsissime puberulis. *Sepala* lineari-lanceolata, glabra

vel leviter puberula, acuminata, 3-4 mm. longa. *Corollae tubus* cylindricus, curvatus, 2-3 cm. longus, basi 3-4 mm. diametro paulo ampliato, duobus trientibus inferioribus horizontaliter triente superiore verticaliter dispositis, angulo recto inflecto, fauce dilatato 6-7 mm. diametro, extra glaber, fusco- vel rubro-purpureus, e sinubus ad basin lineis pallide viridibus ornatus, intus supra basin sparse villosus; lobi 2.5-4 cm. longi, filiformi-lineares, e basi ovata erecti, apice latiores et cohaerentes, intra basin villosi, margine inferne pilis purpureis ciliato, ceterum glabri. *Corona exterior* fere cupuliformis, lobis 5 subquadratis minute 3-lobulatis 1.5 mm. longis; interior membranacea, lobis 5 linearibus 2.5 mm. longis apice recurvatis.

TRANSVAAL. Waterberg; Ridding Meads, Dec. 1912, Miss S. M. Stent 10179 (typus); Mosdene, Naboomspruit, on basaltic loam, E. E. Galpin M. 215: "corolla-tube greenish with brown stripes".

1313. *Ceropegia turricula* E. A. Bruce [Asclepiadaceae]; affinis *C. Barklyi* Hook f., sed foliis linearibus, lobis corollae brevibus pilis purpureis ornatis, lobis coronae interioribus linearibus differt.

*Herba* perennis, erecta, simplex vel supra basin ramosa, 8-15 cm. alta; caules breviter crispe brunneo-pubescentes, internodiis circiter 5 mm. longis. *Folia* erecto-patentia, subsessilia, anguste linearia, glabra vel pilis paucis oblecta, acuta vel subacuta, basi cuneata, 5-9 cm. longa, 1.5-3 mm. lata, margine revoluta leviter undulata. *Flores* axillares et terminales, solitarii, erecti, pedicellis 5-8 mm. longis sparse brunneo-pubescentibus. *Sepala* lineari-lanceolata, sparse brunneo-pubescentia, acuminata, circiter 4 mm. longa. *Corollae tubus* circiter 2.5 cm. longus, erectus, basi 4 mm. latus, supra medium paulo contractus, fauce dilatato 8 mm. diametro, intus apicem versus purpureo-hirsutus, extra glaber, purpureo- et subflavido-notatus; lobi late lineares, erecti, 9 mm. longi, 2 mm. lati, basi deltoidei, apice obtusi, cohaerentes, pilis purpureis vibratilibus ornati. *Corona exterior* 5-lobata, lobis poculiformibus 2 mm. longis apice bifidis, segmentis anguste triangularibus acutis 0.8 mm. longis margine longe ciliatis; interior 5-lobata, lobis erectis glabris lineari-filiformibus 4 mm. longis apice recurvatis.

TRANSVAAL. Mosdene, Naboomspruit, in basaltic loam, 31 Jan. 1919, E. E. Galpin M. 697 (typus), M. 216.

1314. *Streptocarpus* (Eu-*Streptocarpus*) *pumilus* B. L. Burt [Gesneriaceae]; species nova nulli arcte affinis, fortasse *S. Bolusi* C. B. Clarke proxima, sed omnibus partibus minoribus et ovario subglabro distinguitur.

*Herba* parva, monophylla, subcaulis, hypocotylo usque ad 3 cm. longo apice folium unum cotyledonare gerente. *Folium* ambitu et magnitudine variabilis, exemplari alio lineari-lanceolatum, 3.5 cm. longum et 4 mm. latum, alio ovato-lanceolatum 2.5 cm. longum et

1.2 cm. latum, margine crenulato-serrata, supra et subtus pilis rigidis pubescens. *Inflorescentia* plerumque solitaria, pauciflora, cymosa, interdum ad florum unum redacta. *Pedunculus* ad 3.7 cm. longus, glaber vel sparsissime pubescens. *Bracteae* (semper praesentes ?) filiformes, 1 mm. longae. *Pedicelli* graciles, circiter 1.5 cm. longi, praecipue apicem versus glanduloso-pubescentes. *Calyx* fere ad basin 5-partitus; segmenta anguste lanceolata, 2 mm. longa, extra sparse pubescentia. *Corolla* 1.2 cm. longa, extra sparse pubescens; tubus leviter arcuatus, 9 mm. longus, fauce leviter dilatatus, ore obliquo; lobi circiter 3 mm. longi et 1.5 mm. lati, latero-inferiores paullum latiores, omnes obtusi. *Stamina* 2; filamenta corollae basi 6 mm. distante inserta, 3 mm. longa, complanata, glabra; antherae 0.75 mm. longae, cohaerentes. *Discus* annularis, levissime lobatus. *Ovarium* 2 mm. longum, sparse pubescens, in stylum 8 mm. longum apicem versus glabrescentem transiens; stigma capitatum. *Fructus* more generis spiraliter tortus, 1 cm. longus.

S. RHODESIA. Rusapi, "in shelter of boulders; flowers mauve, abundant in 'colonies'", 1 Jan. 1935, *F. Eyles* 8359.

**1315. *Streptocarpus* (Eu-*Streptocarpus*) *umtaliensis* B. L. Burt** [Gesneriaceae]; species nova ex affinitate *S. montani* Oliv., a qua capsula longiore, filamentis apices versus glandulosis et floribus albis satis recedit.

*Herba* acaulis, plerumque folio uno cotyledonari. *Folium* ad 25 cm. longum sed apice mortuo et praefracto\*, 5–10 cm. latum, marginibus denticulato-serratis, utrinque, sed praecipue subtus in nervis, pilis rigidis appressis tenuiter vestitum; nervi laterales inter se 0.5–1 cm. distantes, angulo 45° ascendentes. *Inflorescentia* solitaria vel 3–4 e basi folii orientes et tunc una aliis multo maior. *Pedunculus* inflorescentiae maximae 10–20 cm., aliarum 3–10 cm. longus, breviter et patente pubescens. *Flores* numerosi, binati, cymose dispositi. *Bracteae* ramorum primorum inflorescentiae 2–4 mm. longae, pubescentes, saepe caducae, aliorum minores vel absentes. *Pedicelli* 5–10 mm. longi. *Calyx* fere ad basin 5-partitus; segmenta anguste lanceolata, 2 mm. longa, trinervia, basi 0.5 mm. lata, extra et marginibus rigide pubescentia. *Corolla* inflato-tubularis, fauce subtus leviter ventricosa, 1.3 cm. longa, lobis 5 obtusis circiter 2 mm. longis et fere aequilatis, extra pubescens. *Discus* annularis, vix 0.5 mm. altus. *Stamina* 2, corollae basi 2.5 mm. distante inserta; filamenta 3 mm. longa, apices versus glandulosa; antherae dorsifixae, 1.5 mm. latae, inter se cohaerentes. *Pistillum* 9 mm. longum; ovarium dense pubescens, in stylo aequilongo angustatum; stylus apicem versus glabrescens, stigmate capitato instructus. *Fructus* (maturus?) anguste cylindraceus, spiraliter tortus, 3.5 cm. longus.

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\*In *Streptocarpus* the cotyledonary leaf which enlarges continues to grow throughout the life of the plant. The growing region is near the base of the leaf and as growth takes place the leaf apex withers and dries back; it is therefore impossible to give an absolute length for the leaves of these plants.

S. RHODESIA. Umtali, "common forest epiphyte with white flowers", 1560 m., 19 Feb. 1926, *F. Eyles* 4475 (typus). Umtali, "on rocks and trees in forest", 1500–1800 m., 1 Feb. 1932, *Miss A. Cripps* (6799 in *Eyles* herb.)

The floral resemblances between *S. umtaliensis* and *S. montanus* are so strong, that there can be little doubt that the two species are closely related. According to the classification at present in use, however, *S. montanus* must be placed in the section *Rosulati*, *S. umtaliensis* in the *Unifoliati*. Indeed these two species provide a clear indication that this subdivision of the genus is artificial and it is probable that in the subgenus *Eu-Streptocarpus* characters drawn from the shape of the corolla will eventually prove of greater value in the delimitation of natural sections.

1316. **Dioscorea (Stenocorea) Garrettii** *Prain et Burkill* [*Dioscoreaceae*]; species cum *D. daunaea* *Prain et Burkill*, comparanda, sed foliis minoribus atque floribus minoribus haud reflexis facile distinguenda.

*Partes hypogaeae* ignotae. *Caulorum* sinistrorsum volubiliū partes superiores adhuc tantum visae, glabrae, inermes, liris crebris parum elevatis notatae, ubi floriparae ad 2 mm. crassae. *Folia* alterna, simplicia, basi alte cordata, apice brevius acuminata, ad 12 cm. longa, ad 6 cm. lata, pertenuia, 7-nervia, supra glabra, subnitida, intense viridia, subtus pallide viridia: nervi primarii nervo mediano proximi ab hoc sensim divergentes ad apicem usque attingentes: paris secundi nervo mediano abruptius divergentes et ad laminam mediam desinantes: paris tertii per lobos basales meantes ad laminae marginem sistant: secundarii spatia interjecta transeuntes quam reticulationem vix manifestiores: nervi primarii supra parum, subtus distincte elevati: petiolus ad 4 cm. longus.

*Flores maris* pedicellati, ad 50, inter se 2–5 mm. remoti, secus axes racemorum spiciformium dispositi; axes ad 20 cm. usque longi, ad basin interdum ramosi, glabri, pertenues, leviter angulati: pedicelli breves, 0.25–0.5 mm. longi, cum axe angulos rectos efficientes: bractae sublancoolatae, 1 mm. longae, glabrae, sublucidae, pedicellos haud amplectentes; bracteola ovata, parum acuminata, 0.5–0.75 mm. longa, perlucida. *Perianthii* limbus subrotatus, margine axin tangente et nonnulla ex parte eum amplectente: tubus aliquatenus infundibuliformis, 0.5 mm. altus. *Sepala* ovata, apice late obtusa, sub anthesin horizontalia vel parum recurva, 1-nervia, 1.5 mm. longa. *Petala* cum sepalis subconformia vel leviter sursum reflexa et apice magis rotundata. *Stamina* 6, ad marginem disci inserta; filamenta erecta sed superne sub antheras eminus conniventes incurva; antherarum lobi quam lati vix longiores. *Gynoeceium* conicum, parvum, apiculis 3 coronatum.

*Planta foeminea* ignota.

SIAM. Doi Chieng-dao, *Garrett* 972 (typus); Muang Ngao, prope Lampang, *Put* 4007.



**1317. *Dioscorea (Enantiophyllum) hainanensis* Prain et Burkill** [*Dioscoreaceae*]; species e grege *D. alatae* Linn., ad *D. Fordii* Prain et Burkill, et ad *D. kraticam* Prain et Burkill, proxime accedens, sed ab eis propter laminam foliorum in petiolum angustatum discrepans, et cum eis ob petiolos longiores a *D. brevipetiolata* Prain et Burkill distans.

*Partes hypogaeae* nondum visae. *Caulorum* partes superiores adhuc tantum lectae glaberrimae, inermes, rigidae, liris parum notatae, ad 4 mm. usque crassae, dextrorsum volubiles. *Bulbillae* haud visae. *Folia* plerumque opposita, late lanceolata vel lanceolato-ovata, majora apud basin in petiolum obtuse angustata, minora ibidem subacute angustata; apice aliquatenus acuminata; ad 10 cm. usque longa, ad 3·5 cm. usque lata, 3-5-nervia; supra glabra, hebetia, nervis primariis distinctis ceteris vix conspicuis; subtus glabra, paene concolorata, nervis primariis fere elevatis, secundariis prominulis vel distinctis, nervulis obscure reticulatis: nervi paris primi a nervo centrali sensim divergentes ad apicem attingentes: nervi secundarii spatia interjecta transeuntes: petioli ad 3 cm. longus.

*Flores maris* spicati, spicis in inflorescentias sine foliis ad 18 cm. usque longas decurvas aggregatis. *Axes* inflorescentiarum glabri, graciles, paene angulati; axes spicarum glabri, anfracti, distincte angulati, floribus in flexibus insertis. *Bractae* minutae, 0·3 mm. tantum longae, bases alabastrorum elongatorum vix circumcludentes. *Sepala* late ovata, 1·25 mm. longa, obtusa, maculis rubro-brunneis notata. *Petala* sepalis minora, 0·75 mm. longa, maculis rubro-brunneis notata. *Stamina* 6, incurva, 0·5 mm. longa, filamentis quam antheris longiores.

*Flores foeminei* ignoti.

HAINAN: in ditione Taam-yeung, in vallecula parva apud Mei-yeung-tsuen, *Ts'ang Wai Tak* 787 (typus). Sha-po-shan apud Tin-woh, *Ts'ang Wai Tak* 604!

**1318. *Dioscorea (Lasiophyton) Scortechinii* Prain et Burkill var. *parviflora* Prain et Burkill** [*Dioscoreaceae*]; a typo spicis maris paullulo minoribus griseis (nec rufescentibus), sepalis petalisque minoribus (0·75 mm. longis) tenuioribus differt.

HAINAN, sine locis, C. Wang 33578 (typus), 33926.

The type of *D. Scortechinii*—a specimen obtained by Father Scortechini and bequeathed by him to the Royal Botanic Garden, Calcutta—carries mature fruit. When we described it, we identified with it a fruiting specimen from Mount Bavi in Tonkin. In 1917 we were able to procure the male plant from Scortechini's locality and now we have received the male plant from Hainan: we find that they differ in the size of the flowers and give the varietal name above to the Hainan plant. Whether the Tonkin plant is the type or the variety, we do not yet know; but the geographic position of the Tonkin locality suggests that it is the variety.

The female plant has been collected in Hainan (*C. Wang* 34279 and *H. Y. Liang* 63347) in specimens which, if not ideal, are true as far as they go.

**1319. *Littonia rigidifolia* Bredell** [Liliaceae]; affinis *L. modestae* Hook., sed foliis angustioribus et rigidioribus valde distinguitur.

*Herba* tuberosa. *Tuber* parvum, circiter 1 cm. diametro, carnosum *Caulis* plus minusve 35 cm. longus, erectus, simplex, glaber, sursum foliosus, basin versus foliis (plerumque 1 vel 2) alternis vaginantibusque praeditus. *Folia* sursum ternatim verticillata, sessilia, 3–8.5 cm. longa, 0.2–0.8 cm. lata, linearia vel lineari-lanceolata, apice acuta et cirrhifera, glabra, marginibus involutis et costa infra conspicua. *Flores* solitarii, axillares. *Pedicelli* 0.6–2.2 cm. longi. *Perianthium* viride vel flavidum; tubus usque ad 5 mm. longus, segmenta usque ad 1.7 cm. longa nonnunquam breviora, usque ad 0.8 cm. lata, vel ovato-lanceolata, apice paullo acuminata, intus basi appendicibus duabus ciliatis producta. *Stamina* perianthio breviora; filamenta perianthium aequantia; antherae 6 mm. longae, lineari-oblongae. *Ovarium* 2 mm. longum, multiovulatum; stylus 7 mm. longus; rami styliorum 3, falcati. *Fructus* ignotus.

TRANSVAAL. Waterberg distr.; Geelhoutkop, *van der Merwe* in *Nat. Herb. Pretoria* 20299 (typus) and 20488; Kafferskraal, on the Great Waterberg Plateau, 30 miles west of Naboomspruit, *Galpin* 11672.

**1320. *Pothos Brassii* B. L. Burt** [Araceae—Pothoideae]; specie nova in serie *Longevaginataram* sectionis *Allopothos* iuxta *P. Barsberianam* Schott ponenda, a qua spatha et spadice brevior (illa spadici aequilonga), pedunculo graciliore, foliis basi leviter cordatis distinguitur.

*Planta* scandens, glabra, ramulis quasi infra-axillaribus (quod gemma vaginam folii fulcrantis perrumpit). *Folia* alterna, petiolata; petiolus 5 cm. longus apice incrassatus et geniculatus, fere ad geniculam alatus, alis 2–3 mm. latis basi vaginam formantibus; lamina anguste elliptica, 10–15 cm. longa, c. 3–4 cm. lata, ad apicem acuminata, basi leviter cordata; nervi collectivi utrinque 3, 2 marginem approximantes, 1 c. 4 mm. intra marginem currens. *Pedunculus* c. 6 cm. longus. *Spatha* late lanceolata, c. 3 cm. longa et 1 cm. lata, apice marginibus incurvis cuspidata 1 mm. longa formantibus. *Spadix* spatha aequilongus, 0.5 cm. crassus. *Flores* hermaphroditi. *Tepala* 6, late obovata, 1.25 mm. longa, 1 mm. lata, apice rotundata, dorso plica longitudinali (interiora) vel transversa (exteriora) instructa. *Stamina* 6, 1.5 mm. longa, filamentis complanatis, antheris parvis. *Ovarium* 1 mm. altum, stigmate subsessile.

NORTH QUEENSLAND. Slopes of Thornton Peak, "a large, leafy climber; inflorescence white", 300 m., March 15, 1932, *Brass* 2311.

*P. Brassii* is the first species of the section *Allopothos* to be recorded from Australia ; the two other Australian species of this genus are *P. Brownii* Domin and *P. longipes* Schott and both belong to the series *Longipedes* of the section *Eu-Pothos*.\* *P. Barberiana* Schott with which *P. Brassii* has been compared in the diagnosis, is a native of the Malay Peninsula, Sarawak and Borneo ; the leaves are relatively broader and have closer lateral nerves and the peduncle is stouter than in *P. Brassii*.

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## XLVII—NOTES ON THE GENUS SCHIMA AND ON THE CLASSIFICATION OF THE THEACEAE-CAMELLIOIDEAE. H. K. AIRY-SHAW.

### THE GENUS SCHIMA.

The most recent as well as the most complete account of the genus *Schima* is that by Melchior in Engl. Pflanzenf. ed. 2, 21, 138 (1925), where a partial key to most of the known species is provided. The author remarks that a monograph of the genus is much to be desired. Ample support for this opinion has been found during a recent examination of the genus in the course of naming the material collected by the Oxford University Expedition to Sarawak in 1932. The following criticisms and emendations of Melchior's treatment are the outcome of this investigation, and are arranged under the key-lettering employed by him in the Pflanzenfamilien.

A. Here must be inserted *Schima sinensis* (Hemsl. et Wils.) Airy-Shaw, comb. nov. (*Gordonia sinensis* Hemsl. et Wils. in Kew Bull. 1906, 153 ; Melch. in Engl. op. cit. 137). Although the original authors pointed out (correctly) that this species was nearest to *G. Lasianthus* (L.) Ellis (the only species of *Gordonia* Sect. *Lasianthus* DC.), Melchior places it at the end of his Sect. *Nabiasodendron* and states that it differs so greatly from the species of that section that its systematic position seems to him doubtful ! *Schima sinensis* is actually closely related to *S. khasiana* Dyer, from which it differs principally in its orbicular, externally glabrous sepals, almost glabrous petals, and ovoid (not spherical) shortly-beaked capsule. In the last character there is a definite approach to *Gordonia Lasianthus*. Melchior certainly seems right in placing this group at the beginning of the genus. *S. antherisosa* Korth., however, which he includes here, is indistinguishable from *S. crenata* Korth. (see B. b. β. I., *infra*).

A further species of this alliance is *S. Forrestii* Airy-Shaw, sp. nov.† It may be readily distinguished from both *S. khasiana* and *S. sinensis* by its very large flowers (nearly twice as large), by its

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\*Engl. Pflanzenr. Arac.—Pothoid. 22, 36 (1905)

† *Schima Forrestii* Airy-Shaw, sp. nov. insignis, a proxima *S. khasiana* Dyer foliis crassius coriaceis siccitate subtus glaucescentibus supra cinereo-

shorter and much more robust glaucous peduncles, and by the thicker consistency of its greyish-green leaves. The sepals and young petals are externally sericeous as in *S. khasiana*.

**B. b. α. *S. superba* Gardn. et Champ.** Probably synonymous with this is *S. liukiuensis* Nak. in Bot. Mag. Tok. 32, 223 (1918), judging from Nakai's description and from a specimen in Herb. Kew. (open foothills, Nago, Okinawa [cf. Nakai's localities], 14 Apr. 1912, W. R. Price 1412) which is doubtless Nakai's species. *S. liukiuensis* is not mentioned by Melchior.

**B. b. β. I. *S. Noronhae* Reinw.** has entire leaves, as described by Blume; it should therefore come in group C. Its place in the present group (B) should be taken by *S. crenata* Korth., which is not mentioned by Melchior.

**B. b. β. II. *S. confertiflora* Merr.** is doubtless synonymous with *S. superba*. Handel-Mazzetti (Symb. Sin. 7, 396: 1931) treats both species as synonymous with *S. crenata* Korth. In the latter, however, the leaves are usually thinner in texture, the peduncles very much longer, and the sepals silky-pubescent on the back and spreading or reflexed, not glabrous on the back and suberect or adpressed to the corolla as in *S. superba*.

**C. a. *S. argentea* Pritz.** To this species, *S. Mairei* Hochr. must certainly be reduced; see Hand.-Mazz. Symb. Sin. 7, 397 (1931). *S. Mairei* was described as having peduncles about 1.5 cm. long,

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viridibus, pedunculis brevioribus crassioribus, floribus subduplo maioribus recedit.

*Arbor* 12–18 m. alta. *Ramuli* robusti, subglaucopruinosi, glabri, lenticellis minimis pallidis conspersi. *Folia* oblongo-lanceolata, usque 21 cm. longa (petiolo circiter 2 cm. longo incluso) et 6.5 cm. lata, basi leviter angustata vel subrotundata, apice breviter acuminata, margine haud crebre subcrenato-serrata, utraque pagina glabra, subtus opaca et subglaucous, costa et rete venularum argute prominente, supra nitidula et cinereo-viridia, costa impressa, rete venularum obtuse prominulo; nervi laterales iis *S. khasianae* simillimi. *Flores* speciosissimi, expansi 6–7 cm. diametro, circiter 6 apicem ramulorum versus haud confertim dispositi. *Pedunculi* rigidi, crassi, 2–3 cm. longi, 3–4 mm. diametro, decurvi vel recti, ancipites, in calycem sensim ampliati, ut ramuli glauci et lenticellosi, inferne puberuli vel glabrescentes, supra bracteolas magis tomentelli. *Bracteolae* suboppositae, caducae, 4–10 mm. infra pedicelli apicem sitae. *Calyx* cupulari-turbinatus, parte tubulari apice circiter 1 cm. diametro tomentella; sepala suborbicularia, 6–8 mm. diametro, extra dense sericea, marginem ciliatum versus glabrescentia, intus infra medium glabra, supra medium adpresse sericea, patula vel patentia. *Petala* plus minus obovata, 3–3.5 cm. longa, 2–3 cm. lata, extimum valde cucullatum extra totum sericeum, cetera extra basin versus tantum sericea, omnia intus glabra, ochroleuca. *Stamina* numerosissima, 1.5–2 cm. longa; antherae brevissime oblongae, 1–1.5 mm. longae. *Ovarium* late ovoideum, circiter 5 mm. diametro, leviter sed distincte sulcatum, dense adpresse sericeum, apice glabro in stylum crassum glabrum circiter 1 cm. longum attenuato, stylo in stigma subquinguelobum vertice planum circiter 4 mm. diametro ampliato. *Capsula* ignota.

CHINA. Yunnan: open situations on the hills to east of Teng-yueh, lat. 25° N., 1800 m., June 1912, Forrest 8341 (Herb. Edin., Herb. Kew.): "Tree of 40–60 ft. Flowers creamy-white, fragrant."

not 2–4 cm. as stated by Melchior. A further synonym of *S. argentea* is probably *S. bambusifolia* Hu in Journ. Arn. Arb. 11, 224 (1930), from Kwangsi, but no authentic material has been seen. The following specimen in Herb. Kew. adds *S. argentea* to the Indian flora :—ASSAM : Manipur State, Ching Sow, 2100 m., fr. Apr. 1882, G. Watt 6718. In FORMOSA a form occurs with glabrous calyx and corolla : South Cape, Schmürer in Henry 366, 659 (Herb. Kew.).

C. b. *S. boninensis* Melch. is a later homonym, and also a synonym, of *S. boninensis* Nak. in Bot. Mag. Tok. 32, 222 (1918), the correct name for which is *S. Mertensiana* (Sieb. et Zucc.) Koidz. in Bot. Mag. Tok. 44, 107 (1930), based on *Cleyera Mertensiana* Sieb. et Zucc. Fl. Jap. 1, 154 (1835).

C. c. α. *S. brevipes* Craib appears to be merely a form of *S. Wallichii* (DC.) Choisy ; the foliage is identical.—*S. bancana* Miq., and also *S. Beccarii* Warb. (1922 ; omitted by Melchior) appear to be short-peduncled forms of *S. Lobbii* (Hook. f.) Pierre, included by Melchior (l.c. 137) under *Gordonia* Sect. *Nabiasodendron*, B. a. β. I.

C. c. β. *S. mollis* (Wall.) Dyer, at present known only from fruiting material, remains a problematical plant. It is probably only a form of *S. Wallichii* (DC.) Choisy.—*S. sericea* Airy-Shaw (in Hook. Ic. Pl. t. 3309) comes here.

D. a. The relationship of the very distinct *S. brevifolia* (Hook. f.) Baill. ex Stapf is probably with *S. Mertensiana* (S. et Z.) Koidz., as indicated by the large size of the sepals and petals.

D. b. *S. stellata* Pierre is *Craibiodendron stellatum* (Pierre) W. W. Smith in Kew Bull. 1914, 129 (*C. shanicum* W. W. Sm. 1911)—*Ericaceae*.

#### THE CLASSIFICATION OF THE CAMELLIOIDEAE.

A very conservative policy has been adopted by Melchior in his treatment of the *Theaceae* for the second edition of the Pflanzenfamilien. This is unfortunate, since the careful anatomical work of Beauvisage (Ét. anat. fam. *Ternstroem.*, 1918 ; Contrib. ét. anat. fam. *Ternstroem.*, 1920) has shown clearly that, for instance, the tribes *Bonnetieae* and *Pelliciereae* are each sufficiently distinct from the *Theaceae* (*sensu stricto*) to warrant family rank, and that the genus *Asteropeia* truly belongs with the *Flacourtiaceae* (*Samydaceae*) where it was originally placed. Hallier (in Beih. Bot. Centralbl. 34 (2), 35 : 1916) has produced strong evidence to show that the genus *Tetramerista* is a member of the *Marcgraviaceae*, but Melchior (in Engl. l.c. 125) and also Gilg and Werdermann (ibid. 100) appear to consider this evidence insufficient. Similarly, within the *Theaceae* proper, Melchior has rejected the results of Pitard's anatomical work (in Act. Soc. Linn. Bord. 57, Cpt. Rend. Sci. 1 : 1902), in which it is demonstrated that the genera *Schima* Reinw., *Lacathea* DC. (i.e. *Franklinia* Marsh.) and *Gordonia* Ellis (*sensu stricto*, i.e. excluding all species except the type, *G. Lasianthus* (L.) Ellis) form a natural group widely different from the group comprising *Pyrenaria* Bl.,

*Haemocharis* Salisb. (i.e. *Laplacea* H. B.K.) and the spurious *Gordonias* (i.e. *Polyspora* Sweet ex G. Don, 1831 ; syn. *Nabiasodendron* Pitard), which are much more closely related to *Camellia*, *Tutcheria*, etc. A further flaw in Melchior's classification is his inclusion of the genera *Stewartia* and *Franklinia* under the key-heading : " Sepals unequal in size and gradually passing into the corolla " : actually the sepals and petals are as distinct in these two genera as they are in *Schima*. He moreover associates with *Schima* the genus *Hartia* (since justifiably reduced to *Stewartia*\*) to form the subtribe *Schimiinae*, under the key-heading : " Sepals small....." ; but the sepals of *Hartia* are large and foliaceous, exactly as in *Stewartia serrata* Maxim. and *S. sinensis* Rehd. et Wils.

The following modified version of Melchior's arrangement of the brachyantherous *Theaceae* is therefore proposed. Only characters of external morphology are here mentioned, but those interested will find them strikingly corroborated in most instances by the anatomical evidence published by Pitard (l.c.).

- Antherae breviter ovoideae, versatiles ; fructus capsularis, dehiscent (rarissime drupaceus : *Pyrenaria*).....A. **Camellioideae**  
 Pedicelli plerumque pluribracteati ; sepala a petalis haud abrupte dissimilia, spiraliter disposita ; capsulae columella praesens, persistens.....I. **CAMELLIEAE**  
 Semina exalata .....I. 1. *Camelliinae*  
*Piquetia*, *Stereocarpus*, *Camellia*, *Tutcheria*  
 Semina alata, vel fructus drupaceus .....I. 2. *Laplaceinae*\*\*  
*Laplacea*, *Polyspora*† (*Nabiasodendron*), *Pyrenaria*  
 Pedicelli semper bibracteolati ; sepala et petala quina, abrupte dissimilia .....II. **GORDONIEAE**‡  
 Sepala elongato-oblonga, rarius suborbicularia, herbacea ; capsulae colomolla deficiens ; semina anguste alata vel exalata ; folia decidua, raro sempervirentia. II. 1. *Stewartiinae*§  
*Stewartia* (incl. *Hartia*)  
 Sepala suborbicularia, rigida ; capsulae columella praesens, persistens ; semina alata (raro exalata : *Franklinia*) ; folia semper virentia, rarius decidua.....II. 2. *Gordoniinae*||  
*Franklinia*, *Gordonia* s. str., *Schima*  
 Antherae elongatae, basifixae ; fructus varius, indehiscens.....  
**B. Ternstroemioidae**

\* Vide Cheng in Contrib. Biol. Lab. Sci. Soc. China, 9, 202 (1934). *Hartia sinensis* Dunn (*Stewartia pteropetiolata* Cheng, nom. nov.) is, however, so closely related to *S. sinensis* Rehd. et Wils. that it does not seem advisable to distinguish it as a section, as proposed by Cheng, merely on the basis of its evergreen habit.

\*\***Laplaceinae** *Airy-Shaw*, subtrib. nov. *Laplace*[e]ae DC. in DC. Prodr. 1 526 (1824), quoad *Laplaceam* tantum ; *Gordoniinae* Melch. in Engl. op. cit. 135 (1925), excl. *Gordonia Lasiantha* (L.) Ellis (typo nominis generici *Gordoniae*!).

† **Polyspora** Sweet, Hort. Brit. ed. 1, 61 (1826), sine descr. ; G. Don, Gen. Syst. i. 574 (1831), descr.—Type (only original) species : *P. axillaris* (Roxb. ex Lindl.) Sweet, l.c., based upon *Camellia axillaris* Roxb. ex Lindl. Bot.

(Footnotes continued overleaf)

## XLVIII.—NOTES ON AFRICAN GRASSES: XX.\*

C. E. HUBBARD.

The following new grasses will be more fully described in a later number of the Kew Bulletin.

**Danthoniopsis intermedia** C. E. Hubbard, sp. nov.; affinis *D. minori* Stapf et C. E. Hubbard, et *D. wasaënsi* (Vanderyst) C. E. Hubbard, ab illa culmis 2-nodibus gracilioribus, foliorum laminis usque ad 4.5 mm. latis, glumis fere glabris, gluma inferiore subacuta; ab hac culmis rigidis paniculam versus glabris, nodis villosulis, foliorum laminis angustioribus, paniculis linearibus angustioribus, glumis et lemmate sterili angustioribus differt.

NORTHERN RHODESIA: Broken Hill, *Broken Hill Govt. School* 12.

**Helictotrichon Thomasii** C. E. Hubbard, sp. nov.; affine *H. angusto* C. E. Hubbard, culmis paniculam versus asperulis, foliorum vaginis retrorsum scaberulis, laminis demum reflexis, panicula angustiore circiter 6 mm. lata, glumis brevioribus, lemmatibus 7-nerviis, arista brevioris usque ad 1 cm. longa differt.

SUDAN: Mongalla Province; Imatong Mtns., Mt. Kineti, 2700 m., *Thomas* 1862.

**Koeleria cristata** (L.) Pers. var. **shiraënsis** C. E. Hubbard, var. nov.; a var. *convoluta* (Hochst.) C. E. Hubbard (*K. convoluta* Hochst.), culmis validiusculis, panicula 1-2 cm. lata, spiculis 6-7.5 mm. longis, glumis longioribus 5-7.5 mm. longis, lemmatibus longioribus 5-7 mm. longis differt.

TANGANYIKA TERRITORY: Shira Mtns., west of Mt. Kilimanjaro, 3000 m., *Haarer* 1122A.

**Pentaschistis ruwenzoriensis** C. E. Hubbard, sp. nov.; a *P. borussica* (K. Schum.) Pilger, foliorum vaginis basalibus tenuioribus, laminis planis tenuioribus, paniculis densis, spiculis 7-9 mm.

\* Continued from K.B. 1936, 335.

Reg. 349 (1819) (*Gordonia anomala* Spreng. Syst. 3, 126: 1826).—Syn.: *Antheischima* Korth. (1842); *Carria* Gardn. (1847); *Dipterosperma* (nec *Dipterospermum*) Griff. (1854); *Nabiasodendron* Pitard (1902); *Gordonia* Sect. *Nabiasodendron* Melch. (1925); *Gordonia* auctt. plurim., non L.

† Sensus stricto DC. Prodr. 1, 527 (1824) (excl. *Gordonia* Sect. *Haemocharite*), non sens. ampl. Benth. et Hook. f. et auctt. plurim.

§ **Stewartiinae** *Airy-Shaw*, subtrib. nov. (diagn. uti supra in clavi). *Stuartieae* et *Stuartiées* Choisy, Mém. Fam. Ternstr. et Cam. 47 (1855). *Camelliinae* (quoad gen. *Stewartiam*) et *Schiminae* (quoad gen. *Hartiam*) Melch. in Engl. op. cit. 133 et 139 (1925).

• || **Gordoniiinae** Melch. (quoad *Gordonia lasianthum* (L.) Ellis tantum), emend. *Airy-Shaw*; *Schiminae* (quoad gen. *Schimam*) et *Camelliinae* (quoad gen. *Frankliniam*) Melch. in Engl. op. cit. 127 et 138 (1925).

longis, anthoeciis 2.6–3 mm. longis, setis lateralibus 3–5 mm. longis, aristis 11–17 mm. longis differt.

UGANDA : Toro District ; Mt. Ruwenzori, on rocks in River Namwamba, 3090 m., *Taylor* 2903.

**Pentaschistis meruensis** *C. E. Hubbard*, sp. nov. ; affinis *P. borussicae* (K. Schum.) Pilger, foliorum vaginis basalibus pilosis vel villosis, spiculis plerumque majoribus 6–10 mm. longis, anthoeciis longioribus 3–4 mm. longis, setis lateralibus 4–7 mm. longis, aristis 8–14 mm. longis differt.

TANGANYIKA TERRITORY : Arusha District ; Mt. Meru, dominant plant on sandy ash scree above *Erica* zone, 3600–3750 m., *Burt* 4062.

**Pentaschistis imatongensis** *C. E. Hubbard*, sp. nov. ; a *P. borussica* (K. Schum.) Pilger, culmis 1–2-nodibus, foliorum laminis linearibus planis 2–5 mm. latis flaccidis eglanduliferis, paniculis contractis densiusculis, rhachi ramis ramulisque eglanduliferis, pedicellis brevioribus 0.5–4 mm. longis, antheris brevioribus 1 mm. longis differt.

SUDAN : Mongalla Province ; Imatong Mtns., Mt. Kineti, 3000 m., *Thomas* 1834.

**Pentaschistis Mannii** *Stapf*, ms., sp. nov. ; affinis *P. pictiglumae* (Steud.) Pilger, sed culmis et innovationibus densius caespitosis, innovationibus latioribus, panicula leviter laxiore, pedicellis paullo longioribus 1–5 mm. longis, spiculis paullo longioribus 6–7.5 mm. longis, lemmatum setis lateralibus 2–4 mm. longis, aristis 6–9 mm. longis columna 2–3 mm. longa differt.

SOUTHERN NIGERIA : Cameroons Mtn., in grassland and on bare rocky ground, 2700–4050 m., *Mann* 1351 (type), 2075 ; *Dalziel* 8353 ; *Maitland* 878, 1244, 1249, 1260 ; *Mildbraed* 10894, 10894a.

**Danthonia Davyi** *C. E. Hubbard*, sp. nov. ; a *D. Macowanii* Stapf, panicula laxiore, glumis leviter angustioribus, lemmatibus brevioribus bilobatis, aristis geniculatis differt.

NYASALAND : Mt. Mlanje, on steep grass slopes of the Lichenya Gorge, 1950 m., *Burt* *Davy* 2068/29.

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## XLIX—MISCELLANEOUS NOTES.

COUNT ERNST SILVA TAROUCA.—We learn with regret that Count Silva Tarouca, the eminent dendrologist, died at Schweigern, Germany, on August 15th, 1936. We are indebted to Prof. K. Domin and to Dr. C. K. Schneider for the following particulars of his life and work.

Count Silva Tarouca was born in 1860 in Moravia. In 1886 he took up his residence at Pruhonice Castle, near Prague, and it



was there that he built up his famous park and arboretum. The site was particularly favourable for such an enterprise, consisting of a series of valleys with well-wooded slopes, lakes, streams and spacious lawns. He employed both native and exotic trees to obtain his landscape effects, many of Wilson's early Chinese introductions finding a place. The great rock garden was his own special care; here he brought together one of the finest collections of alpine plants on the Continent.

About ten years ago the Government of Czechoslovakia purchased the park, but Count Silva continued to direct its activities until his death. It is very gratifying to know that the result of his labours will be permanently preserved for the enjoyment of all lovers of horticulture and dendrology.

Count Silva, who was President of the Czechoslovakian Dendrological Society, published three works in collaboration with Dr. Schneider: "Unsere Freiland-Stauden," "Unsere Freiland-Laubgehölze," and "Unsere Freiland-Nadelhölzer." In addition to his work as a naturalist, he played an important part in the political world, being Minister of Agriculture at Vienna during the war and a member of the Privy Council.

Dr. Schneider writes, "All who have had the good fortune to know Count Silva and his work will mourn the loss of an excellent artist and a great-hearted personality."

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LEONARD RODWAY.—In an obituary notice of Mr. RODWAY, published recently in the Kew Bulletin, we regret that it was erroneously stated that the second volume of his treatment of the "Bryophytes of Tasmania," dealing with the *Hepaticae*, had not appeared. We now find that this volume was in fact published in the "Papers and Proceedings of the Royal Society of Tasmania" in 1916, and also as a separate publication. The account deals with species belonging to 63 genera and extends to 95 pages.

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**Hortus Bergianus.**—On September 16th, 1936, the inauguration of the newly erected botanical institute took place in the Hortus Bergianus (Bergianska Trädgården), Stockholm. Many botanists and horticulturists were present, including representatives from the Academy of Sciences. An exhibition of autumn flowers, especially dahlias, was arranged. Professor Fries (the Director) in his address outlined the history of the Garden during the past 50 years. In the new Institute are housed the well-known Bergius Herbarium and the library. There are also work rooms, laboratories and a lecture room, all of which will be a great asset to the staff and to visiting botanists.

# BULLETIN OF MISCELLANEOUS INFORMATION No 10 1936 ROYAL BOTANIC GARDENS, KEW

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## L—SOURCES OF VEGETABLE WAX. F. N. HOWES.

In spite of the wide-spread occurrence of vegetable waxes throughout the vegetable kingdom, very few are of commercial importance or are regarded as being of potential commercial value. The most important of those known to commerce are carnauba wax, candelilla wax, esparto or "fibre" wax, and "Japan wax". The last mentioned, although commonly referred to as "wax", is not a true wax as will be explained later.

Vegetable waxes are utilised for a variety of manufacturing purposes but principally in the preparation of polishes of various kinds. Other more limited uses to which they are put are in the manufacture of candles of certain types, wax varnishes, cable coverings and electrical insulators, sealing and dental wax, phonograph records, carbon papers, photographic plates and certain pharmaceutical and other preparations for which beeswax is commonly employed. Although the use of vegetable waxes in polishes and dressings for such articles as saddlery or harness may have diminished in recent years, increasing applications for them have been found in other directions, notably in the manufacture of motorcar polishes and in the waxed cartons now so commonly used for food-stuffs. The value of most vegetable waxes for industrial purposes lies largely in their relatively high melting point and in the fact that the addition of even small quantities to other softer animal or mineral waxes may cause a marked rise in the melting point of the resulting mixture.

In the countries of origin certain of the vegetable waxes have been in use, chiefly as illuminants, from remote periods. Some are still commonly employed by native peoples for this purpose in the form of torches or candles, in spite of the now extended use of cheap mineral waxes. In candle-making they are generally mixed with a proportion of tallow or other fat by the natives in order to render them less brittle or to prevent too rapid burning. Only small quantities of vegetable wax are now used in commercial candle-making. Nevertheless candles of vegetable wax are manufactured and marketed for special purposes. They are favoured for church use on account of the agreeable odour they give out when burning.

The term wax is applied somewhat indiscriminately to a variety of plant products that resemble beeswax in general appearance and

physical properties. In some instances, as in the case of Japan wax (*Rhus*) and berry wax (*Myrica*) they consist of glycerides and should be considered chemically as fats rather than waxes, or as mixtures of fat and wax. True waxes are devoid of glycerine or glycerides and are a combination of fatty acids with certain monatomic alcohols. Among plant products waxes may be regarded as intermediate between the fats and the resins, and are perhaps more closely allied to the resins in chemical and physical properties than they are to the fats.

The true waxes are to be found among plants chiefly as a thin surface covering on some particular organ or organs. Almost any part of the plant, with the exception perhaps of subterranean organs, may bear the wax coating. In some plants it may be limited to a certain organ or organs, in others it may occur more or less over the whole surface of the plant. Leaves and fruits are perhaps the parts most commonly affected. The characteristic whitish coating or bloom of numerous fruits, particularly certain varieties of grapes and plums, is due to wax which generally appears as the fruit approaches ripeness or maturity. A more conspicuous development of wax on the fruit is to be seen in the wax gourd, *Benincasa hispida* Cogn. Wax on the leaf surface is readily noticeable in numerous everyday plants such as the carnation, certain conifers, the cabbage and other species of *Brassica*. Other well known genera in which marked wax development on the leaves may occur are *Eucalyptus* (young leaves), *Buxus*, and *Mesembryanthemum*. In these, as in so many other plants, the wax is present in too small a quantity for collection to be attempted for economic purposes. The best known instances where wax occurs in sufficient quantity on the leaf surface to warrant collection are perhaps afforded by the palms, particularly the carnauba wax palm, *Copernicia cerifera* Mart. and the wax banana of the East Indies. Instances of wax development on the stem are well exemplified in certain species of *Euphorbia*, especially *E. cerifera* Alc., the source of candelilla wax, and in the wax palm of the Andes, *Ceroxylon andicola* H. & B. In many of the taller growing grasses and most varieties of sugar cane, wax is very noticeable on the stems and leaf-sheaths, particularly in the vicinity of the nodes. Wax development on the stem is also conspicuous in some varieties of the castor oil plant (*Ricinus*) and on the stems of certain species of *Rubus*, notably *R. biflorus* Buchan. and *R. Giraldianus* Focke, natives of the Himalayas and China respectively, and sometimes cultivated as ornamental plants. In these two species of *Rubus* the wax coating is sufficiently thick to render the stems vividly white in appearance as if white-washed, noticeable particularly in the winter months when the leaves have fallen. In addition to its occurrence on leaves, stems and fruits, wax may also occur in appreciable quantity on the floral organs of some species.

Although wax appears usually on the outer surface, it does sometimes occur and remain in the inner tissue. In *Balanophora*, for

instance, wax is secreted chiefly in the stem parenchyma. In *Ficus* and *Brosimum* wax or wax-like substances occur in the milky sap or latex in admixture with other substances. In cotton (*Gossypium*) wax is present on the seed fibres or lint in extremely small quantities. Although the percentage of wax is so small, commonly ranging from .2–6% (6) it is nevertheless an important factor in certain manufacturing processes with cotton, such as spinning, wetting, dyeing, scouring, etc. and has a direct bearing on the feel of cotton as estimated by the grader.

The method of formation of wax within the plant cell—whether it originates from the protoplasm or the cell membrane— does not appear to be thoroughly understood. It is possible that in view of the wide differences in relationship among plants producing wax, the product may not be always secreted in the same manner. Apart from seed-bearing plants many of the lower plants such as certain fungi, which naturally have different metabolic processes, are known to form wax. The primary function of the wax appears to lie in rendering the organ which it covers impermeable to water, as is the case with numerous fruits on which water or rain may fall without wetting. It no doubt assists also in the prevention of loss of moisture by the plant, exemplified in the wax coated leaves of many species inhabiting desert or semi-desert regions and in strand formations.

Wax occurring on the surface of plant organs may be present in the form of a smooth homogeneous glaze, or as a powder consisting usually of small loosely arranged rodlets, or as small scales or crusts. Frequently the structure is definitely crystalline and in some cases where the wax scales are relatively large they bear on their under surface the impression of the part of the leaf from which they became dislodged.

In the account of wax yielding plants that follows, only those genera or species are dealt with that are known to yield wax in fair quantity or have actually been utilised by man in some part of the world for the production of wax for his own needs.

Montan wax, which is derived from a certain type of coal, and Peat wax may be classed as waxes of vegetable origin. However, as they are more generally regarded as mineral waxes they have not been included in the discussion that follows.

### **Balanophora.**

The *Balanophoraceae* are an interesting family of root parasites that occur chiefly in tropical and subtropical mountainous regions in Asia and South America. The family includes a number of species that exhibit profuse wax development, particularly in the genus *Balanophora* itself.

All the species of the genus do not produce wax, the best known in this respect being some that occur in the mountainous districts of Java, notably *B. elongata* Bl., *B. globosa* Jungh. and *B. Ungeriana* Val. The first mentioned of these is reputed (10) to produce the most

wax and occurs at altitudes between 2,000 and 3,000 metres. The wax occurs in the parenchyma of the rhizome and is present in such quantity that when dried and ignited, the rhizomes burn brightly. They have been used by natives in Java as sources of illumination, candles or small torches being made from them. In order to prepare the torches, specimens of which are in the Kew Museum, the plants are washed, pounded up and heated in a receptacle. Thin strips of bamboo about 15 inches long and 1/8 inch in diameter are then dipped into the molten viscid mass. On being removed the portion that has been immersed remains coated with a layer of waxy material which sets quite hard on cooling. These torches were found to burn slowly and steadily with quite a bright light but a good deal of smoke. The wax itself can be easily separated from the rest of the plant tissue when in the molten state. A sample in the Kew Museum, which is bright yellow in colour, closely resembles beeswax in general appearance and texture. The wax is said to possess a high melting point and to contain a certain amount of fat or resin. It has been stated that *Balanophora* rhizomes are an article of trade among natives in Java but this is believed to be erroneous. Although the percentage of wax is high, it is doubtful whether the plants occur anywhere in sufficient quantity for the wax to become an article of commercial importance (10).

### **Brosimum.**

A so-called wax, cow tree wax, has been described (30) as being obtained from *Brosimum Galactodendron* D. Don, the cow tree of the South American forests. This tree is of large dimensions reaching a height of 100 feet with the trunk usually unbranched for the first 60 or 70 feet and 6 to 8 feet in diameter at the base. It is particularly prevalent in the forests of Venezuela. By making incisions in the trunk a latex or sap is obtained which somewhat resembles cow's milk and is used as an article of food by the inhabitants in some areas. On standing a scum or cream forms which thickens in consistency and becomes yellow in colour. When this sap or milk is boiled, a yellowish white resinous material separates out. It is of soft consistency, somewhat transparent when fresh, and can be kneaded with the hands. Its superficial resemblance to beeswax may have earned for it the name of cow tree wax. Actually the material consists mostly of resin (16). This substance has been used for torches by the inhabitants of the areas where the tree occurs and has also been considered for chewing gum manufacture.

### **Ceroxylon (Ceroxylon or Palm Wax).**

The wax palm of the Andes (*Ceroxylon andicola* H. & B.) which bears a thick coating of a waxy substance on the bole, occurs at altitudes between 2,000 and 3,000 metres. It has a limited distribution, occurring only in western tropical South America, but

is very abundant in some of the areas where it occurs. Attention was first directed to it by the well known travellers Humboldt and Bonpland who found it extending almost to the lower limit of perpetual snow on the mountains lying between the Magdalena and Cauca rivers in Colombia. It is of interest among palms on account of its great size, specimens as high as 57 metres having been recorded, also for its occurrence at much higher altitudes than is usual in the *Palmeae*. It is no doubt the tallest of the palms. In matured specimens the bole is usually about a foot in diameter at the base and is somewhat swollen towards the centre, contracting again as it approaches the crown. The large pinnate leaves attain a length of 20-25 feet and on decaying and falling leave closely set scars encircling the trunk.

The palm is said to present a handsome sight when in fruit as the large hanging racemes of brilliant scarlet fruits form a striking contrast with the white marble-like trunk (5).

Wax is secreted on the bole in thick hard crusts, white or whitish in colour. It occurs also in small quantity as a thin powdery layer on the under surface of the leaflets, but this is not utilised. The great height of the palms renders collection of the wax, which has to be scraped from the bole with a blunt instrument, somewhat difficult. In early times the palms were always felled, but in more recent years encouragement has been given to methods of procuring the wax from the palm without felling and thereby effecting its destruction. The occurrence of moss or lichen on the trunk may impede collection. The wax is present on the bole in quite considerable quantity, that is as compared with most wax yielding plants, and may be  $\frac{1}{2}$  cm. thick (30). The yield of a single palm is about 25 lbs. and to fell and scrape two palms is said to constitute a day's work for one man (24). After collection the wax or wax dust is melted and clarified, or boiling with water may be resorted to. It is an article of commerce among the inhabitants in parts of Colombia. Before being made into candles by the inhabitants, it is usually mixed with about a third its weight of tallow. This is said to render the product less inflammable and more suitable for candle-making.

Specimens of the crude wax in the Kew Museum are in the powdered and in the solid form. The first mentioned is of a pale straw colour, almost white, and the latter yellowish tinged with green. Both possess a pleasant odour. The crude wax contains a good deal of impurity, no doubt on account of the manner in which it has to be scraped from the stem and the fact that earthen moulds may have been used for the molten wax. Purification, however, can easily be effected, a simple method being to heat the crude wax in canvas or calico bags weighted down under water, when the wax rises to the surface (15).

Crude ceroylon wax as scraped from the palm trunk contains a large proportion of resinous material mixed with it. It is this

resinous matter that may account for the relatively high melting point recorded for Ceroxylon wax by some observers. The pure wax, which is present to the extent of about 30%, has been described as golden brown, brittle but not very hard, with a melting point in the neighbourhood of 65° C., which is lower than that for carnauba and candelilla wax. At one time it was thought that the product might well be used as an alternative for carnauba wax for a number of purposes, providing supplies were forthcoming in sufficient quantity and in a reasonable state of purity. However, extensive tests of crude ceroxylon wax by a large firm of polish manufacturers during the last few months led them to the conclusion that it was of little use as a substitute for carnauba wax in polish-making.

In regions where the *Ceroxylon* wax palm occurs other parts of the plant besides the wax are made use of by the inhabitants. The tall straight trunks are very durable and afford a useful material in the construction of dwellings, boats, water pipes, etc. The leaves may be used in roofing and the crown of the palm bears a fibre resembling gommuti fibre or piassaba (24).

It would appear that a distinct or varietal form of this palm may be present in some parts of Colombia. Dawe (5) in an account of a journey through the western portion of Colombia records the occurrence of a dwarfed form of the wax palm on the Cordillera Central which "has the concentric rings around the bole closer and more irregular, the fronds more outspreading, and the wax coating on the underside of the leaves browner in colour." He states that it "more usually affects the higher altitudes" and is of more economic importance from the point of view of wax production.

### Cocos.

Wax has been shown to be present in the sediment which collects on the bottoms of tanks in which coconut oil (*C. nucifera* Linn.) has been stored. Tanchico (28) has extracted and investigated the wax from this sediment or oily residue in the Philippines. He states ".....the purified coconut oil residue does not yield glycerin as a decomposition product and is, therefore, not a glyceride. This residue would appear to be a wax containing the myricyl ester of cerotic acid." He found the purified product to have a melting point of 88° to 90°C. The crude coconut oil residue, after removal of oil, dust and other impurities, was used in combination with other materials in making trial lots of "floor wax", "furniture polish" and "leather polish" which were found to be satisfactory. Little appears to be known regarding the yield of this waxy residue from coconut oil and it is said to vary considerably. According to Tanchico "at one mill it was surmised that 500 tons of coconut oil stored for about three months would perhaps yield 40 kilos of sediment. At others where the oil was stored longer the estimates ran much higher."

### **Copernicia (Carnauba Wax).**

Carnauba wax, which is commercially the most extensively used of the true waxes of vegetable origin, is obtained from the leaves of *Copernicia cerifera* Mart., a palm occurring in north eastern Brazil. It is commonly known as the Brazilian wax palm, whilst colloquial names for it in Brazil are "carnauba", "carnahuba", "carnahyba", "carnanahyba" and "caranda." It occurs in the states of Ceara, Rio Grande do Norte, Pernambuco, Piahy, Maranhão, Matto Grosso, Bahia and also in Venezuela (29). In Ceara it is particularly prevalent and this state is the centre of the wax industry. It frequently occurs in groves flanking the rivers. The palm is remarkable in its propensity for resisting drought and in thriving under conditions of extreme dryness. In most of the areas where it occurs there is normally a prolonged dry season about half the year, when no rain falls. Nevertheless growth and the production of new leaves continues throughout this season. Periods of absolute drought for two or three years have occurred in the Carnauba region and it has been observed (30) that during such times, when all other vegetation is completely parched and dried up, the carnauba palm remains green and may be in flower. It is resistant to fire, and fire does not visibly affect its vitality except in the young stages. During the rainy season some areas where the palm occurs may be subjected to flooding for long periods when the basal portions of the palm become completely submerged. This does not appear seriously to effect the palm in any way. Nevertheless, it is considered to flourish most in areas where it is not subjected to such flooding.

The height of the palm varies from 20 to 40 feet and the circumference of the bole from 12 to 18 inches. The deeply lobed, flabelliform leaves are densely arranged and the crown is more or less spherical. The youngest leaves in the centre of the crown are yellowish or yellowish green in colour due to the presence of a thin powdery coating of wax. This wax occurs on both surfaces but is more strongly developed on the upper surface of the young leaf and causes it to possess a peculiar although pleasant smell at this stage of its development. As the young leaf develops the ash-like waxy coating adheres less tenaciously and may eventually be dislodged by even a puff of wind. When the leaves have wholly expanded little or no wax remains. On this account only the younger leaves are collected for the preparation of the wax.

For wax production the young leaves are collected during the dry season and usually the palms are subjected to two cuttings per month. On an average 8 young leaves are removed from a palm at each cutting or approximately 100 in a season. They are severed by means of a suitable implement—a knife or a sickle—attached to a long pole or stick. The inhabitants show great skill in the cutting of the leaves. In removing the young leaves the youngest inner leaves in the centre are left undisturbed. These furnish the harvest in the



next cutting. The fact that young leaves are cut continuously from the palm during the six rainless months of the year testifies to its vitality. During the rainy months of the year cutting does not take place and normal leaf development occurs.

After cutting, the young leaves are laid out in rows in the open to wilt and dry for several days. This has the effect of loosening the wax coating. They are then conveyed to a convenient centre for removal of the wax, or this may be effected on the spot. The wax is removed by beating each leaf in turn with a stick. Before beating, the leaves are split several times with a knife which facilitates removal of the wax. Cloth or matting may be used to collect the wax as it is beaten from the leaf. The operation may be carried out in the open or more usually in a closed shed or room which helps to minimise loss as the wax particles are light and easily lost by wind. Even when special buildings are used for beating, ventilation has to be provided and any draught carries out a stream of fine wax particles (4). There is always therefore a certain element of loss. This naturally varies in accordance with weather conditions and the amount of care exercised. It is thought by those competent to judge that this loss may sometimes amount to as much as 25% (4). The process of beating is generally carried out by women. After being collected the wax particles or powder are heated in a receptacle with a small quantity of water and when molten run into moulds. On cooling the wax is inclined to break into pieces of irregular size owing to its brittle nature.

The yield of wax obtained from any given number of leaves is very variable as the amount of wax formed is dependent to some extent upon locality and also to a larger degree upon pluviometric conditions. When the rainfall in the wet season preceding cutting is lower than usual a lower wax yield results. It is stated (24) that in very dry years the yield may be only one tenth of that obtained when conditions are favourable. According to figures quoted by Dahlgren (4) for a grove in the district of Fortaleza in Ceara for the years 1921, 1923 and 1931, the average wax production was 6.9 gms. per leaf or 143.7 leaves worked per kilogram of wax obtained. This writer states "The highest yield during the years in question was that of a third cutting in 1923 which gave 10.9 gms. per leaf. The lowest yield was that from the expanded leaves of the first cutting in 1921 which yielded an average of only 4.3 gms. per leaf."

Attention was first directed to the wax of the carnauba palm early last century but export of the commodity did not commence until considerably later. In 1846 about 23 tons were exported from the port of Ceara : and by 1860 export had risen to 60 tons (25). At the present time several thousand tons are annually exported from Ceara. The wax is marketed under several grades which are valued according to colour, purity and oil content. Sand or earthy matter is the chief impurity. The better grades are yellow in colour, while

the inferior are various shades of grey or black. The following are the grades arranged in order of quality—that are commonly imported into this country for manufacturing purposes—"yellow flor", "prime yellow", "medium", "cauhype", "fatty grey", "chalky". "Cauhype" is a grade intermediate in quality between the recognised yellow and grey types. Other inferior grades in the country of origin are those known as "gordurosa" and "arenosa". In polish manufacture different grades are utilised for different types of polish. The wax is brittle, hard and amorphous, with a melting point of 84-86°C. It possesses a peculiar but agreeable odour.

In the early days of the importation of carnauba wax into European countries its use in candle-making was disfavoured owing to the difficulty in bleaching. This however was subsequently overcome. Candles made with it are stated to burn well and to give off a pleasant odour, which accounts for their popularity in church use. Carnauba wax is chiefly of value as a hardening substance for all manner of waxy compositions, a small percentage being often sufficient to raise the melting point considerably. In polishes it causes a high lustre and is used in a great variety of polishing materials, particularly polishes and creams for footwear, leather and furniture. Its use in the manufacture of phonograph and gramophone records is due to its possessing the right degree of hardness without the crystalline structure that is a hindrance with many materials. It is used in the manufacture of carbon papers for typewriting, for certain pharmaceutical preparations, and for various other purposes.

Serious attempts at the cultivation of the Carnauba palm on a large or commercial scale in other countries do not appear to have been made. This may be because of (1) the large amount of labour necessary in the collection of the wax, (2) the lack of information regarding the rate of growth of the palm and the age at which leaf cutting could be commenced and (3) the fact that there are large areas in Brazil in which the palm occurs freely and which have not yet been exploited to any extent for wax. The palm has been introduced to various parts of the tropics for experimental cultivation, chiefly in botanical gardens. It has been grown in British Guiana, the East Indies, East Africa, Ceylon and Malaya. It is stated to grow well at Singapore (2).

Some twenty years ago a Hamburg seed-merchant sent circulars all over the tropics recommending the cultivation of this palm, stating that its requirements as regards soil and climate were not exacting and that it would probably be suitable for interplanting with rubber, cacao, coffee, etc., which is however extremely improbable (10).

In those parts of Brazil where the palm occurs it is put to various minor uses in addition to the production of wax. The leaves yield a fibre which is used by the natives in making cordage, rope, hammocks, fishing nets, etc. In preparing this fibre the leaves are not retted in any way but are simply cut into strips and scutched on

boards set with nails or even fish bones. It was estimated at one time (25) that about a third of all the cordage material used in Ceara was made from the Carnauba palm. The fibre was exported to European countries and used for stuffing mattresses and furniture and in making hats, baskets, brushes, etc. (24). It has been suggested that a use might be found—either for fibre or for paper-making—for the leaves that are collected for wax production after the wax has been removed. Normally these leaves are burned. The mature leaves being light and waterproof are commonly used as a thatching material. Like many other palms the boles are utilised in the construction of dwellings, being hard and fairly durable. When fully matured the boles yield a “wood” which is hard, a bright yellowish red in colour with black streaks and capable of taking a good polish. It has been imported to European countries for the manufacture of walking sticks. The roots are regarded by the natives as possessing medicinal properties and have even appeared in Britain as a substitute for sarsaparilla but, as would be expected, without success. The roasted seeds have been used as a substitute for coffee or fed to cattle and poultry. Like other palms the Carnauba palm can be tapped and syrup or toddy made from the sap. A starchy material or “sago” may also be obtained from the upper part of the stem.

### **Euphorbia (Candelilla Wax).**

The most important wax-yielding species of this large genus is *Euphorbia cerifera* Alc., the source of the candelilla wax of commerce which is derived from Mexico.

The plant is a perennial and consists of a woody root-stock from which arise several cylindrical stems, up to seventy or more, which are somewhat knotted or jointed and vary in height from 2 to 5 feet and  $\frac{1}{4}$  to  $\frac{1}{2}$  inch in diameter. The flowers are yellow and seed is formed profusely. The leaves are small and inconspicuous and soon fall from the stems. They are only present at certain periods, notably while the stems are young. The entire surface of the mature stems is covered with the wax coating, which is very apparent to the sight and touch, and which is easily removed with the blade of a knife or even the thumb-nail. It imparts to the whole plant a greyish-green or ashen appearance. Wax is stated (19) to be present under the epidermis in addition to the external superficial layer or covering.

The shrub occurs freely in many parts of Mexico, particularly in the north and the total area which it covers is very extensive. It occurs in the following States—Puebla, Hidalgo, San Luis Potosi, Tamaulipas, Nuevo Leon, Coahuila, Durango and Chihuahua (19). It also exists in lower California and in the semi-arid highland regions of South West Texas (8). Exploitation for wax has so far been chiefly in San Luis Potosi and Coahuila. In fact it is estimated (8) that approximately 80% of the total amount of candelilla wax reaching the world's markets is from the factories in the vicinity of Nueva Laredo and Piedras Negras, from plants growing mostly in the pro-

vince of Coahuila. From these factories the wax is railed to the port of Tampico for shipment to various parts of the world.

The plant prefers the highlands to low lying regions and occurs for the most part where rainfall is low and where desert-like conditions prevail. In some of the mountainous districts where the plant is exploited roads are few and far between and the shrubs, as they are cut, are tied in bundles and placed on the backs of horses and mules for conveyance to the nearest collecting centre, from which they proceed by vehicular transport to the wax recovery plant. In gathering, the stems are either pulled or cut at ground level with a knife. If pulled, portions of the root accompanied by earthy matter may remain attached to the stems. The yield of fresh plants per acre in some areas is from one to two tons. Naturally yield varies according to the prevalence of the plant and its state of growth. After cutting, from two to five years elapse before the plant completely re-establishes itself.

With regard to the extraction of the wax, two methods are in use (1) the old method by means of boiling water and (2) the more recent method of solvent extraction. The last mentioned is more efficient in every way, for nearly double the percentage of wax is recovered and operating costs are lower. It is the method adopted in the more progressive and up-to-date factories. Many of these are owned or controlled by American interests.

The following description of the old method accompanied by a few remarks on the solvent extraction process are given by Govier (8). "Wooden or lead lined vats are used, capable of treating about 500 lbs. in a batch. A solution of sulphuric acid is used in the vat with a strength of approximately 10% which is heated either with live steam or direct fire. The weeds are tipped into a net of iron chains which is placed in the bottom of the vat before it is filled. The temperature of the contents is raised to boiling point, and the candelilla is kept submerged about 6 inches below the surface of the boiling solution for about 10 minutes, when the molten wax leaves the plant and collects on the surface of the solution. It is then skimmed off and transferred to lead lined or galvanised tanks. The exhausted weeds are lifted out of the vat with chains and burned under the boilers. The solution in the vats is changed about twice weekly.

The crude wax is refined by re-melting, and is kept at boiling temperature to remove the water that has been carried over with the skimmed wax. It is later drawn off from the refining tanks into pans, where it is permitted to settle overnight. Dirt, twigs and other foreign matter settle to the bottom of the pan, and when the cakes are removed from these pans the impurities at the bottom of the wax are scraped off and returned for re-settling. The clean cakes, still retaining considerable moisture, are placed in another refining tank and heated until the moisture is reduced to less than 1% when the colour of the wax is usually a light brown. It is finally drawn off into

pans, allowed to set, then turned out and sacked for market. Alternatively the wax can be bleached by exposure to the sun in thin sheets. By the crude method of recovery described above, it is possible to obtain a yield of from only one to one and a half per cent. of refined wax from the plant."....." For the extraction method the gathered plants are usually allowed to dry in the sun for two weeks before being prepared for extraction. The candelilla is pulverised and placed in solvent tanks containing benzol (carbon tetrachloride can be used) and the wax is dissolved. The solvent wax solution passes through a filtering medium and the clear solution is subjected to distillation, thus recovering the solvent for re-use. This cycle is continuously repeated and if the equipment is efficient, the loss of solvent during the process is very small. The wax residue remaining after the distillation of the solvent can be refined if necessary before cooling and breaking up for packing."

The percentage of wax obtained per unit of the fresh plant varies with plants from different districts and it has been stated (14) that in well watered areas the yield of wax is less than in the more arid districts. It is also claimed (14) that the character of the wax varies somewhat according to the age of the plants and the time of year when they are cut.

There are other wax yielding plants in Mexico of somewhat similar appearance to *Euphorbia cerifera*. One of these is *Pedilanthus pavonis* Boiss. which may occur in the same areas and be known by the same common name. The stems are taller and thicker than those of the true "candelilla" plant and the wax is produced only in negligible amount. It has been suggested that the cutting of such plants along with those of true "candelilla" for wax production may also be responsible for the differences that exist in the properties of different commercial samples of the wax which are so evident. Standley (27) regards *Euphorbia cerifera* Alc. and *E. antisiphilitica* Lucc. as synonymous, but others (19) do not share this view and believe that two quite distinct plants are involved.

True candelilla wax is grey or greyish black in colour, coarse grained, opaque and somewhat brittle. The purified wax is generally brown or reddish in colour, opaque to translucent, with a pleasant odour not unlike beeswax. It is not so hard or brittle as carnauba wax. The melting point of the crude wax is between 80 and 92°C and of the purified wax between 67 and 82°C. (30). It is commonly exported only partly purified in the form of large broken lumps in sacks each containing from 70 to 80 kilograms. Unlike carnauba wax recognised commercial grades do not appear or exist. The wax has not been known for so very long and first appeared at an exhibition at San Antonio in 1907 (30). By 1910 it had appeared on European markets and in the following years production increased and candelilla wax soon became a well known commodity among the users of vegetable waxes, being utilised in very much the same manner as carnauba wax.

The industrial uses of candelilla wax are many. On account of the high lustre it imparts it is specially favoured for polishes and creams for foot- and leather-ware. It also enters into the composition of various other polishes, particularly floor and furniture polish. Mixed with other materials, rubber, gutta percha, etc. it is employed in electric insulating materials and varnishes. Other uses for the wax are found in the water-proofing of fabrics, in dental moulding compositions, paint removers, paper sizes, sealing waxes, metal lacquers and lithographic colours (19).

Many other succulent species of *Euphorbia* exhibit wax development on the stems in a greater or less degree, but as a rule it is not marked and the wax is present only in small quantity. Two species that have attracted attention on account of the wax present are *Euphorbia xylophylloides* Brongn. and *E. stenoclada* Baill., both of which occur in Madagascar. These species have not, however, been exploited commercially. It was found (9) that after the plants had been cut into small pieces and dried the wax could be easily beaten off. The product so obtained was placed in boiling water when the molten wax could be skimmed from the surface. An alternative method tried was to place the plant direct into boiling water after collecting. This method, however, gave a smaller yield of wax but the delay caused in drying was obviated. With it a yield of just over one pound of wax was obtained from a single somewhat undersized plant of *E. xylophylloides*. It was considered that larger plants growing at lower altitudes would yield double the quantity of wax. The yield from *E. stenoclada* was found to be a little less than that of *E. xylophylloides*.

#### **Ficus (Godang Wax).**

Wax or wax-like substances have been obtained from the latex of certain species of *Ficus* (30), the best known being the godang "wax" of Java. This wax, or so-called wax, is yielded by *Ficus variegata* Bl., a large forest tree with a wide distribution over south-east Asia and common in parts of Java. It is stated that in middle and west Java godang "wax" is prepared by the natives by heating the latex to which water has been added, over a fire. The grey to brown coloured "wax" eventually rises to the surface and is removed. It can be bleached and has been sold in the bazaars for use in batik work and for candles. A similar "wax" is stated to have been prepared in Sumatra and Ceylon (30).

According to some observers this "wax" is little known in Java and is probably seldom or never prepared now or used in batik work. It has been shown that the so-called wax in the crude state consists mostly of resin and that it is hardly justifiable to term it wax (10).

#### **Langsdorffia.**

This is another parasitic genus of the *Balanophoraceae* which, like *Balanophora*, secretes wax freely.

The solitary species of the genus, *Langsdorffia hypogaea* Mart., has a wide distribution in Central and Southern America and has been recorded from Mexico to Southern Brazil, having thus a range of about 52° latitude. It occurs chiefly at the higher elevations and is reputed to be common in some of the mountainous areas of Colombia.

The wax occurs within the tissues of the plant and not as a superficial layer or coating. It is present to the extent that if one end of a stem or rhizome be lighted, it burns as freely as a wax taper. In referring to the species, Sir Joseph Hooker (11) stated "This species yields so large a quantity of wax that candles are made of it in New Grenada. The secretion is contained entirely in the cellular tissue, where it appears as a large opaque mass in every utricle. Mr. Purdie informs me that near Bogota the stems are collected and sold in the markets under the name of *Siejos*, and used as candles on saints' days. On the Tolima range it is called "Belacha", and "Melousita" on the mountains around Bogota where its soft receptacle is eaten when ripe and considered stimulating and refreshing. It is remarkable that *Langsdorffia*, the only monostylous American genus, should resemble *Balanophora* in the abundance of its waxy secretion; whilst *Rhopalocnemis*, the only distylous Asiatic species, resembles the other American *Helosideae* in the absence of wax."

### **Linum** (Flax Wax).

The outer epidermal layer of the stem of the flax plant, *Linum usitatissimum* Linn., contains wax in appreciable quantity (30). This wax, which may be obtained as a by-product in the preparation of flax, has been prepared and used for manufacturing purposes.

A detailed account of experimental preparation of this wax and the possibilities of its use commercially has been given by Gibson (7). This writer points out that the wax is contained in the fine dust or "pouce" which accumulates during the various combing and drawing processes to which the raw flax fibre is subjected on entering the spinning mill. This dust, usually regarded as a troublesome waste material, may contain up to about 10% of wax. It may be removed by solvent extraction processes, although various difficulties have to be faced.

Flax wax extracted from material grown in various parts of the world and under various conditions did not exhibit any marked differences in properties. The following is a description of it—"Flax wax corresponds closest to beeswax, from which it is distinguished by a slightly lower saponification value, a higher iodine value, and a distinctly higher melting point. The wax is of a dark green or brown colour, according to the state of the chlorophyll present, which is apparently mainly affected by the process of retting, and the ripeness of the flax straw when pulled. It resembles beeswax closely in character but is slightly harder and rather

more brittle. It is not, however, a brittle wax like carnauba wax. Owing to its higher melting point and greater hardness it is superior to beeswax in its capacity to give an extremely high polish. The polished film of flax wax is stated by Honneyman to be more durable than that of carnauba wax on account of its greater plasticity. For these reasons flax wax would be a very valuable constituent of polishing preparations unless a pale colour was essential" (7).

### **Musa (Banana Wax).**

Certain species and varieties of *Musa*, both wild and cultivated, form wax to a noticeable extent on the fruits, petioles, or under surfaces of the leaves. In one of the well known cultivated cooking varieties of banana in Malaya (pisang abu) the ripe fruits, although actually yellow, are ashen in appearance owing to a well developed waxy coating. A similiar variety (abu kehel) showing profuse wax development on the fruits exists in Ceylon and is also popular for cooking.

Throughout Java and Malaya wild bananas occur (forms of *Musa zebrina* van Houtte and *M. malaccensis* Ridl.) in which the under-surfaces of the leaves are quite white owing to the presence of wax (12). In parts of Java, this wax has been collected and utilised by the natives, but in Malaya this does not appear to be the case. Possibly the wax layer on the leaves is more profuse in Javanese forms than in Malayan. It is quite probable environmental conditions may partly determine the extent of wax formation for it is stated (10) that in *M. zebrina* in Java wax development is greater at the higher altitudes than at the lower levels. Where this species occurs it is often very prevalent, particularly on the margins of forest, in jungle clearings and along river banks. It reaches a height of 10-20 feet or more in favoured situations and bears several leaves about 6 feet in length and 2 feet across. In order to obtain the wax the leaves are cut and the white mealy undercoating, consisting of wax, scraped off by hand by means of blunt knives and wooden implements. This is then placed in boiling water and the molten wax subsequently removed from the surface. It is stated (10) that another practice is to place the scrapings in one of the leaf sheaths of the plant which is kept at an inclined position over a fire. As the wax melts it runs down and drips off the end of the leaf sheath, where it is collected in some receptacle or other, often an empty coconut shell. The wax may then be filtered through some fibrous material in order to remove impurities.

It would appear that this so-called " banana wax " was better known and more generally used in Java in the past than it is at present, being a bazaar commodity in some areas and used in batik work. It is described (30) as being hard, more or less transparent, and white, creamy yellow or light green in colour, according to the amount of chlorophyll that has become mixed with it. It breaks with a coarsely crystalline fracture and is easily powdered. Usually a good



deal of fragmentary plant material, and sometimes insect remains, are present. The melting point is high (79-81°C.) and no doubt various uses would be found for the wax if production on a larger scale were practicable.

It is stated (10) that the yield of wax in Java is approximately  $\frac{1}{2}$  Kgm. per 100 leaves or 5 gms. per leaf. Recent figures for carnauba wax in Brazil indicate 6-9 gms. per leaf as an average yield. In view of the considerably greater surface of the banana leaf as compared with that of the young leaf of the carnauba palm it is apparent that the wax yield from the banana is relatively considerably less. Furthermore the process of extraction is a good deal more laborious. According to Heyne (10) one man does not collect in a day more than  $\frac{1}{8}$  kati (1 kati =  $1\frac{1}{2}$  lb. approx.) of wax for which two loads (man loads) of leaves have to be worked.

### **Myrica** (Myrtle "Wax").

Many species of *Myrica* bear a waxy coating or encrustation on the fruits, which is collected and utilised as wax in various parts of the world. The material is not a true wax as has already been pointed out, for it consists largely of glycerides and is more correctly regarded as a vegetable fat. Countries where the so-called wax myrtles occur freely and are exploited for "wax" are South Africa, North America, Mexico and Colombia.

The "wax" obtained from the different species of *Myrica* in these countries is very similar in appearance and general properties. The same method of extracting appears to be employed throughout. The fruits or "berries" are collected by hand from the plants, or, in some instances may be shaken from the bushes on to canvas or cloth spread beneath them. Then are then placed in boiling water or more usually in sacks or bags, preferably loosely woven, which are kept immersed in boiling water for a time, when the "wax" rises to the surface and is collected and moulded into cakes of the desired shape. The "wax" appears as the fruits approach maturity and hardens to a crust consisting of numerous minute scales. It may also occur on the leaf surface but in insufficient quantity for collection. The colour is grey or more often pale or dark green, owing to the presence of chlorophyll and colouring matter or other impurity from the pulp of the fruit. When bleached or chemically refined it is white. The purity of the "wax" is dependent in some degree upon the age of the fruits when collected and the care exercised in extraction. In some species, when the fruits or "berries" are unduly old, the dried pulp is inclined to break into small fragments which became contaminated with the "wax". Prolonged boiling tends to extract colouring matter from the pulpy material which darkens the "wax". The chief use of *Myrica* "waxes" is for candle-making in the countries of production and as an adulterant of beeswax. Their relatively low melting point, generally between 40°C. and 45°C. no doubt precludes their more extended use for industrial purposes. Occasionally parcels

of myrtle "wax" are handled by wax dealers in this country. Candles made from it from the Cape and from Colombia were found to burn slowly with little smoke but a rather poor light and to give off a somewhat balsamic odour.

In South Africa several species of *Myrica* bear a waxy encrustation on the fruits and are capable of yielding "wax" in a greater or less degree. These species are for the most part evergreen shrubs occurring in sandy maritime areas in the south western districts where they are sometimes very prevalent. *Myrica cordifolia* Linn. is probably the best known species and has the largest fruits bearing the most "wax". It is common in and around the Cape Peninsula and elsewhere in the Western Cape Province where "berry wax" is a well known commodity. It is stated (23) "It is extensively used by the Dutch population of the Western Province in conjunction with paraffin wax and soap as a home-made floor-polish, but manufacturers of floor-polishes maintain that it lacks certain essential properties for use in manufactured polishes. It makes an excellent material for use in oil baths in chemical laboratories, being preferable to paraffin wax, as it can be heated to a much higher temperature without emitting unpleasant vapours. It is stated that the Hottentots use it as an article of food." The "wax" attracted attention as early as 1777 (21) and has frequently been the subject of investigation with a view to commercial utilisation. Small quantities have in the past been exported to Europe and the United States. A soap of good quality and agreeable odour can be made from it, but the usual costs of production of the wax do not allow of its extended use in this direction. It is stated one man can collect from  $1\frac{1}{2}$  to 2 muid sacks of the "berries" in a day and that one muid sack yields from 11 to 14 pounds of "wax". At the Cape the months from May to November are regarded as the best for collecting. The plant occurs under a variety of soil conditions but attains to its best development and yields most prolifically in maritime situations where it is often an important species in the "fixing" of sand-dunes on account of its spreading branches and root-system. The shrub does not come into bearing until about 4 years of age and is inclined to fruit sporadically from one season to another in some areas (21).

In North America the "wax" obtained from the fruits of *Myrica cerifera* Linn., the wax myrtle, became an article of commerce in the early days of colonization there and was exported. This shrub or small tree is native to the south-eastern United States and occurs abundantly in some areas, particularly in moist, sandy localities in Carolina, Virginia and Pennsylvania. It also occurs in the West Indies. The early settlers in North America made free use of the "wax" in candle-making. The fruits, which are about  $\frac{1}{8}$  inch in diameter, are at first green, then blackish and eventually white when the waxy encrustation has formed. They may persist on the branches throughout the winter and 4 lbs. of

"berries" are said to yield 1 lb. of "wax" (20). Another North American species with profuse "wax" development is *Myrica carolinensis* Mill. the "small waxberry" or bayberry. This shrub is smaller than the closely related *M. cerifera* and has been regarded by some as a northerly form of it. The fruit is somewhat larger than that of *M. cerifera* and is believed to be still used as a source of "wax" in some areas. The plant has a wide range extending from Nova Scotia and New Brunswick to Florida.

In Mexico at least two species of *Myrica* are exploited for "wax". These are *M. mexicana* Willd. (syn. *M. xalapensis* H.B.K.) and *M. Pringlei* Greenm. The first mentioned, a shrub or small tree reaching a height of about 20 feet, is the best known. It is widely distributed, occurring roughly from Tamaulipas to Yucatan and extending also into British Honduras. Common names recorded for it are—árbol de la cera, huaucanalá (Veracruz and Oaxaca), chac-lolo (Chiapas) (19). In some areas in Mexico it is very prevalent and forms extensive thickets. The fruits are about 1/6 inch in diameter and a labourer is alleged to be able to collect 25-30 kgms. of "berries" in a day which yield on an average  $1\frac{1}{2}$  kgms. of "wax" (19). Mixed with tallow it is commonly used for candles and is sold on the markets in some parts of Mexico. The "wax" is also used medicinally there—being taken internally for jaundice and diarrhoea—and small quantities have been exported (27). The other "wax" yielding species, *Myrica Pringlei* Greenm., has similar "berries" but is considerably smaller—not exceeding 3 to 4 feet in height. It is known to occur in Oaxaca, Puebla and Hidalgo.

Wax myrtles occur in various other Central and South American countries. Where "wax" is prepared by the inhabitants doubt exists in many cases regarding the specific identity of the species of *Myrica* concerned. In the Museum collection at Kew there are samples of typical *Myrica* "wax" from Peru, Ecuador, Colombia and Nicaragua. Doubtless "wax"-yielding species of *Myrica* occur also in some of the neighbouring countries. *Myrica arguta* H.B.K., which has a wide range, is the species exploited in many instances. It occurs on the Cordillera Central in Colombia where it is known as "cera de laurel" or "olivo", being said (5) to be very abundant in the ravines in the environs of Manizales. "Wax" is prepared from it in Colombia and is employed for candle-making. In the Kew Museum collection there are *Myrica* "wax" candles from Colombia which were forwarded by W. Purdie, one of the early Kew collectors who collected during the period 1843-5. A note accompanies them stating that (at that time) these candles were "sold in all the villages of the mountains at  $\frac{1}{2}$  a real or 3d. per pound, which is much cheaper than common tallow." Another specimen from a well known collector of last century is a piece of *Myrica* "wax" or "cera de laurel" from the "Forest of Canelos, Ecuador" and forwarded by R. Spruce in 1863.

### **Raphia (Raffia Wax).**

The raphia palm of Madagascar, *Raphia pedunculata* Beauv., which is the source of the raffia or bass so extensively used in horticulture and fancy work, bears a wax coating on the under surface of the young leaflets. This wax has been collected and its properties investigated, Attention was first drawn to it in 1867 (9) but no further notice of it was taken until about 40 years later when organised experiments on the wax-yielding properties of the palm were made in Madagascar and samples of wax forwarded to European countries for report. A large firm of wax refiners has recently informed the writer that "occasionally supplies of Raffia wax are obtainable".

The palm is common in parts of Madagascar and favours low-lying humid situations, being often abundant along water courses and in swampy areas. It occurs also in drier habitats and it is stated the quality of fibre obtained is variable and depends upon locality (22) It is possible the quantity of wax obtainable from the leaves may also vary according to situation. In addition to Madagascar the palm occurs in parts of East Africa. A special feature of it is the exceptionally large size of the leaves, the rachis of which may be 50 feet and the leaflets or pinnae 5 to 6 feet in length in well grown specimens. Young leaves which are just about to unfurl are in the best stage for the preparation of raffia and are those selected by the natives who carry out the work. These young leaves are cut and taken to the collectors' villages or temporary camps and the leaflets stripped from the rachis. Women then remove by hand the upper epidermis from each leaflet, these epidermal strips when dried constituting the raffia of commerce. After the epidermis has been removed, the leaflets are cast aside and accumulate in large quantities. It is then that the wax can be collected from them if so desired

In order to collect the wax, the discarded leaflets are placed on matting or cloth and allowed to dry for several days, sheltered from the wind. Protection from wind is necessary as the wax particles are so light that loss may be caused even by slight breezes. After drying, the wax is easily dislodged by beating and may be gathered up in the form of a fine powder or dust. It is then sifted to remove leaf fragments or other extraneous matter and placed in boiling water. The molten wax floats to the surface and is skimmed off and placed in other receptacles to solidify. The yield of wax is relatively small, that from one experiment being 75% of the weight of leaves or 17% of the weight of raffia fibre extracted from them (17). When one considers that the annual export of prepared raffia from Madagascar has been between 7000 and 9000 metric tons in recent years (22) and that 10 to 17% of this quantity may be taken as the potential wax yield from the leaves cut, it is apparent what large quantities of wax yearly go to waste adhering to the discarded leaflets.

The solidified raffia wax is yellow to dark brown or chestnut in colour and can be readily powdered. It is hard and brittle and in many respects resembles carnauba wax in physical properties, although differing in composition. It possesses approximately the same melting point and exhibits the same behaviour with various solvents (17).

In connection with early attempts at establishing production of the wax, the following remarks from the "Board of Trade Journal" (Sept. 10, 1908, p. 534) are of interest. "The natives were at the time of discovery induced to prepare about 100 lbs. of this wax which was offered for sale at the market of Maravoay in October 1905. It was sold in small lots at 1/- per lb. Beyond these sample lots no shipments have been made nor has the preparation of wax been continued, the price of 1/- per lb. hitherto offered being considered by the natives insufficient to recompense them for the time and trouble expended on its preparation, a very large number of leaves being required to produce even 1 lb. of wax."

### **Rhus (Japan "Wax").**

The fruits of certain species of *Rhus* contain a fatty substance, chiefly in the pericarp, which is generally although erroneously referred to as "wax". The best known of these species is *R. succedanea* Linn., the source of the so-called "Japan wax" of commerce. Other species of *Rhus* occurring in China and Japan also contain a fatty or wax-like material in the fruit and may be exploited for "wax".

*R. succedanea* Linn. is a small tree with a wide distribution in Eastern Asia and occurs in the Himalayas, Indo-China, China and Japan. It is in the two last mentioned countries that it is exploited for "wax". In Japan it exists both wild and cultivated and is stated to be very prevalent in the islands of Shikoku and Kiushiu, particularly in the provinces of Higo, Hizen, Chikugo and Chikuzen. In addition to field culture it is grown along roadsides and on the edges of cultivated fields. Trees are systematically pruned and manured and propagation can be effected either from seeds or basal shoots. Several different varieties or cultivated forms are recognised. It is stated (18) that trees grown from seed do not commence to bear until the fifth to seventh year. The maximum yield is reached in about the fifteenth year when 60 lb. of fruit may be expected or even considerably more is well favoured situations. Subsequently the yield gradually diminishes.

The greenish brown fruits, which are about the size of a pea when dry and contain a single seed, are borne in bunches and ripen in the autumn. If left they remain attached on the tree for quite a considerable period. After collection they are usually sun dried for a few days preparatory to being worked for "wax". Several methods are employed in extracting the "wax", the more recent being by the use of solvents. Other methods consist of placing the

ground or bruised fruits in boiling water and separating the molten "wax" that comes to the surface or subjecting the ground fruits to the action of steam and then pressing. By the last mentioned method different qualities of "wax" are obtained, that from the first pressings being the best. In order to obtain the last traces of "wax" from the presses small quantities of perilla oil (*Perilla ocymoides* Linn.) may be added. This causes the resulting product to be somewhat softer and is said to account for the variation in hardness in commercial samples of Japan wax.

This "wax" has been in use in Japan since remote times, being employed chiefly for candle-making and to a lesser degree for polishing purposes. Considerable quantities are now exported, the "wax" being used for a variety of purposes including the manufacture of wax matches, polishes, crayons, special soaps and some of the uses to which other vegetable waxes and beeswax are put. It is also used in laundry work. The melting point (50-54°C.) is appreciably lower than that of most vegetable waxes (13). It usually appears on European markets in cakes, about 6 inches square and 1½ inches thick, creamy white in colour and opaque, sometimes stamped with Japanese characters. If much moisture is present in the "wax" the surface becomes covered in time with a fine pure white crystalline deposit.

### **Saccharum** (Cane Wax).

In the Sugar Cane, *Saccharum officinarum* Linn., a waxy substance occurs freely on the stalks in the form of a white powdery layer. This layer or film varies in thickness on different parts of the stalk and also with different varieties of cane. In some varieties it may be almost absent, in others present to the extent of .05% (30). Its development is usually most pronounced in the proximity of the nodes.

Wax is very prevalent on the well known variety known as uba which is now widely distributed throughout the warmer countries of the world and has played so important a part in the sugar industry of Natal, largely on account of its general hardness and high yielding capabilities. The stalks of this variety are thin with long internodes and the heavy wax coating gives to them a peculiar bluish bloom. Where this cane is milled the filter press cake may contain up to 17% of crude wax and 14% is quite common. This percentage is in excess of that in most cane-growing countries. When the cane is burned before cutting—a common method in Natal of removing the trash which is tenacious in this variety and difficult of removal by hand—the quantity of waxy material in the press cake does not exceed 10% (3). There are serious difficulties to be overcome in extracting the wax in a pure state from the press cake, as it occurs there contaminated with fatty and resinous substances.

If the wax is removed by mechanical means from the stalks before milling this contamination does not occur and the wax is

then obtained is a fairly pure state. However, no practically successful method for the mechanical separation of the wax from the stalks has yet been devised, although various attempts have been made. These include brushing the wax from the stalks by machinery before milling or removing it by subjecting the canes to a stream of hot water with provision for subsequent recovery of the wax. Attempts at obtaining the wax from the juice by centrifugalizing have also been made, the cloudiness or turbidity of cane-juice after milling being largely due to the presence of wax particles in suspension. However, it would appear that these methods have not met with lasting success and that at present the only commercial method of obtaining the wax is by the extraction of the filter-press cake with solvents. This is the method that has been adopted in Natal where large scale production of wax has perhaps received more attention than elsewhere. It has been found that the fatty substances present in the filter press cake tend to disappear on prolonged exposure to the air, resulting in a harder crude wax containing a higher percentage of pure wax (23).

Refineries for preparing cane wax were first established in Natal at Durban in 1916, the wax being used locally for industrial purposes, chiefly the making of boot and floor-polish. It was also exported, 250 tons being exported to London during the following two years. Drawbacks have been raised by some polish manufacturers against the extensive use of the wax (as generally received) chiefly on the grounds of colour and difficulty of bleaching, in some instances odour, and the fact that on prolonged contact with moisture it has a tendency to become granular (23). The writer has been informed by a representative of a large firm of polish manufacturers that attempts at using the wax on a large scale by his firm were not satisfactory, one of their chief objections being the offensive odour which permeated the whole factory while it was being worked. However, occasional supplies of cane wax are said to be obtainable in this country.

Chemically purified cane wax is a shining, pale yellow product, resembling refined carnauba wax in many respects. It is hard, readily pulverisable and capable of giving a high polish. Melting point figures given by different workers vary somewhat but are mostly in the neighbourhood of 80°C. (23, 30).

### **Stipa (Esparto or Fibre Wax).**

Esparto grass (*Stipa tenacissima* Linn.) is a raw material obtained from certain Mediterranean countries, chiefly Spain and Northern Africa, which is largely used in the paper-making industry. Wax occurs on the leaves and may be collected as a by-product when the grass is treated for paper manufacture.

Esparto grass (in the dried state) reaches the paper mills in this country in the form of tightly pressed bales. Before the necessary chemical treatment for paper-making is possible these

bales have to be loosened and torn to pieces, a process performed by machinery. During this operation a good deal of dust is liberated which is drawn off in a strong air current and subsequently collected. This dust was formerly regarded as simply a troublesome waste material, but was later shown to contain from 25 to 50% of wax, which may be extracted by various means. Wax occurs also in the alkali liquor in which the grass has been boiled, which, however, is said to be scarcely worth recovering as it is present only in small quantity and the quality is inferior to that obtained from the dust (1).

This wax obtained as a by-product from the esparto paper industry, is now used by polish and other manufacturers in this country and is known by the trade name of fibre wax. The quantity of dust obtainable from any one paper mill is not large and the output of the wax is said to be insufficient to meet the demand. The melting point of the wax has been given as 74°C. (1). A sample recently received at Kew is dark brown to chocolate in colour and very hard and brittle.

Wax is present to a noticeable degree on numerous other grasses, particularly among tropical species and those occurring in arid regions. Among Australian grasses wax is well developed in *Glyceria ramigera* F. Muell., a perennial species known as cane grass or bamboo grass and occurring in some of the inland areas of New South Wales, Victoria and South Australia. This grass and its wax have been described by Smith (26) who states: "It is a coarse cane-like species, has a hard stem and grows in what are known as 'cane swamps'. It has considerable weather-resisting properties and being quite suitable for thatching is employed for that purpose in localities where it grows abundantly.....The entire stem is coated with an almost colourless wax which separates in flakes when the stem is sharply bent. The wax as thus separated melted at 82°C. and in appearance, melting point and hardness, much resembles carnauba wax and might be equally well employed for industrial purposes. It is sufficiently hard and brittle to be powdered, and although but little soluble in ether, yet the ether has the property of separating the wax entirely from the stem, the greater portion falling to the bottom of the containing vessel as a whitish powder." The cut stems or culms were found to yield 2.6% of wax (26).

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## LI Notes on an Expedition to the Rupununi District British Guiana: T. A. W. DAVIS

The material which has formed the basis of recent parts\* of Mr. N. Y. Sandwith's current series of "Contributions to the Flora of Tropical America" was collected during a tour of the balata forests, of the Rupununi District. The collection of botanical specimens

\* See K.B. 1933, pp. 323-339 ; 1935, pp. 117-132.

was only a secondary objective, and was restricted to some extent to the forest trees, as lack of transport prevented me from carrying sufficient presses to make a more general collection. My work on balata necessitated my spending a considerable part of the time in the heart of the forest, away from the banks of the larger rivers, to which collecting in such regions is usually more or less confined; the ground covered is therefore partly new, though the Schomburgks collected extensively in the district about ninety years ago.

The tour was made between June and November 1931, *i.e.* during the greater part of the rainy season (May to August) and the beginning of the dry season (September to April). June and July were spent partly at Apoteri near the mouth of the Rupununi River, and partly in touring camps of balata bleeders, one excursion being made to King William IV's Fall on the upper Essequibo, and one to the junction of the Kwitaro and Rewa Rivers. Each journey occupied eleven days, and about a dozen camps between one and eight miles from the river banks were visited. Where the camps were near the river I usually had an opportunity of going farther back and seeing the forest in which the men were working. Much of the time in the Essequibo was spent in travelling and I went into the forest only in the hilly country near King William IV's Fall, but in the Rewa the camps visited were well distributed, and were all in the plain to the north of the Kanaku Mountains. Throughout August I was camped on the Simuni Creek about five miles from the foot of the mountains near the western end of the lowland forest region lying between the Kanakus and the Essequibo and Rupununi Rivers. In the upper reaches the Simuni flows through dense forest, lower down through open savanna, but with the forest never far from its eastern bank. The country covered in this part of the district is probably a fair sample of the large tract of forest in the plain between the Pakaraima and Kanaku ranges.

From Simuni I went up the Rupununi into the northern savanna (*i.e.* the area between the Pakaraimas and Kanakus lying to the west of the forest region) with the intention of camping somewhere in the interior of the Kanaku Mountains, but through lack of porters I was unable to carry this out, the only form of transport I could obtain being a light bullock cart. I was fortunate, however, in meeting a rancher who was going up the Rupununi into the mountains to a place a few miles above the Maparri Creek, and spent two days there with him. About the middle of September I crossed the savanna to Bon Success on the Takutu where I made my headquarters, and went into camp for a fortnight at the edge of the forest which skirts the base of the mountains. Here my work was confined to the base and northern slopes of the range near Mts. Iramaikpang and Nappi.

My last journey in the district took me into the savanna to the south of the Kanakus, where I spent five days on Mt. Kusad, an isolated forest-clad range some ten to twenty square miles in area

situated about the middle of the savanna, and a week on the Kanakus near Sand Creek Village on the eastern side of the Rupununi. The northern slopes of the Kanaku Mountains are everywhere wooded and the forest extends for a mile or so into the plain at their foot. The southern slopes however, are only partly clothed in forest which seldom encroaches into the plain, and in many places the savanna ascends to the tops of the outer ridges; patches of it occur even on the hills and in the valleys immediately beyond them. The Indians require forest land in which to grow their cassava (*Manihot utilissima*) and other provisions, so that whereas the Makushis living near the northern foot of the mountains can make their clearings in the forest at their base, the Wapisianas of the southern savanna have to ascend to the upper valleys to find a ground suitable for cultivation. The paths to their fields are usually good enough for pack bullocks to be used, and horses can be ridden over them except on the steepest gradients. Often there are houses near the fields in which the Indians stay while making new clearings, the distances being too far from their permanent houses. As a result food and shelter for a short period can be obtained in certain places on the mountains, which more than half solves the transport problem, and enabled me to reach localities more remote than I found possible on the northern side.

The forests covering the plain between the Essequibo and the northern savanna are of a definite and remarkably uniform mixed type. They are decidedly drier than the mixed forests of the North-West District or the Greenheart (*Ocotea Rodioei* (Schomb.) Mez), Morabukea (*Mora Gonggrijpii* (Kleinh.) Sandwith) and mixed forests of the central part of the Colony, and are intermediate in character between evergreen tropical rain and monsoon forest. The difference shows itself in the greater number of predominant trees, and of deciduous species, the slightly more open and irregular canopy, and the rather less luxuriant undergrowth. The average size of the leaves of the trees which form the upper layers of the canopy is decidedly smaller than in the true rain forests, and the mimosaceous type of leaf is commoner. The average height of the canopy is between 100 and 120 feet, and the outstanding trees are up to 150 feet high. Large areas along the rivers are flooded to a considerable depth annually during the rainy season, but in the dry season they have a low water table. These are normally covered with a somewhat dense growth of small trees which form a close canopy with a greatest height of thirty or forty feet. Above this canopy the large branchy rather flat-topped crowns of scattered trees of considerable girth but no great height rise at intervals. There is usually little or no herbaceous ground-cover in such localities. The more permanent swamps support a type of vegetation in which palms, principally *Maximiliana regia* Mart. (kokerite) and *l* (possibly an *Oenocarpus*) are dominant, or in wetter places *Euterpe* sp. (manicole). Open forest of rather small-stemmed trees with a

closed ground-cover of tall coarse grasses is another common type on swampy ground.

The floristic composition of these forests is markedly different from that of the true rain forests nearer the coast. The association has as its dominants *Mimusops Balata* (Aubl.) Gaertn., *Swartzia* sp. (? *S. leiocalycina* Benth.), (wamara), and locally *Aspidosperma excelsum* Benth., (yaruru), which is here sometimes gregarious. The principle families are more or less the same in both types, but in the *Mimusops-Swartzia* association the *Leguminosae* and *Sapotaceae* are everywhere dominant, and the *Rosaceae* and *Lecythidaceae*, though probably next in importance, are less abundant than in the rain-forest, and in the case of the latter the genus *Couratari* is probably represented by as many or more individuals than *Eschweilera*. In the lower layers of the canopy the *Annonaceae* are represented by a great number of species, but *Tapura guianensis* Aubl., (waiaballi), is actually the dominant species. *Bertholletia excelsa* H.B.K., (Brazilnut), occurs locally in the Kwitaro and Rewa rivers, and two small areas of greenheart (*Ocotea Rodioei* (Schomb.) Mez) forest were found in Simuni Creek. Mora (*Mora excelsa* Benth.) forest is of common occurrence in suitable localities, and covers considerable areas along the streams near the base of the mountains. It is similar to the Mora forests of other parts of the Colony, though its associates are naturally the species belonging to this district.

The forests of the Kanaku Mountains appear to vary considerably from place to place especially in their flora, but my examination of these was too sketchy for my observations to be of much value. Generally speaking they are similar in character to the *Mimusops-Swartzia* type, but rather more mixed, and if the localities I visited are typical the dominants are not the same. On the south side of the Kanakus there is a marked tendency for a single species such as *Peltogyne* spp. and *Mimusops excelsa* Ducke, (iwakush), to become locally the sole dominant, especially on rather dry rocky slopes. On the slopes near the rivers the sand kokerite palm (? *Attalea* sp.) was found to be dominant on the northern side of the Kanakus both on the Rupununi River and in one locality on the Essequibo. It is probable that the forests of the remoter valleys are more uniform in character.

The transition from forest to savanna is marked by the presence of patches of savanna in the forest, but the actual line of division is abrupt. I saw one such patch not more than two acres in extent as far east as Apoteri, and on the left bank of the Rewa they are said to occur fairly frequently and occupy considerable areas. The savanna is mainly open grassland, the higher ground being covered almost exclusively by a single species, whilst the low-lying areas subject to inundation have a more mixed vegetation of sedges, grasses, and many dicotyledonous herbs. The grassland is interspersed in places with low bushy trees and shrubs, which form patches or belts with the trees widely spaced, and in some places orchard-like groves which

occasionally form a partly closed canopy. The dominant species is *Curatella americana* L., (sand-paper bush), and other abundant species are *Bowdichia virgilioides* H.B.K., (mach), *Antonia ovata* Pohl var. *pilosa* (Hook.) Prog., (inyak), *Byrsonima crassifolia* (L.) H.B.K., (idin), a *Plumeria*, a *Psidium*, and *Acacia polyphylla* DC., (parika), the last usually growing only near the edge of patches of forest which occur here and there in the savanna, and are locally termed islands. The small areas of forest on the higher ground have a distinct flora of their own, which, however, includes many species which occur in the neighbouring forest areas. Among the most characteristic species are *Centrolobium paraense* Tul., (kartang), *Cordia trichotoma* (Vell.) Arab. and *Lucuma sericea* Krause. The canopy is between 60 and 80 feet high, and the undergrowth dense, shrubby, and with little foliage. The islands I visited are probably all of secondary origin. Along many of the streams where the banks are low there is a fringe of *Mauritia* palms, which sometimes form patches of closed forest in low-lying areas; where the banks are higher there may be a narrow fringe of bushes and low trees, among which are *Eschweilera Schomburgkii* (Berg) Ndz., *Licania coriacea* Benth., *Licania* sp., and *Swartzia dipetala* Willd. ex Vogel, or occasionally they may be bordered by open grassland.

The flora of the Rupununi District is akin to that of the adjacent districts of Brazil. The savannas are identical with those which occupy a large tract of country round the Rio Branco, of which they are in fact the eastern extremity. In the forest areas the flora differs more than would be expected from that of the Guiana rain forest to the north-east of them, the difference being greater than can be explained by a slightly lower rainfall. From what little we know of it, it appears to be more closely allied to the Amazonian flora. The inference is that the forests of the Kanaku Mountains and the plain along their northern base are pre-climaxes of the Amazon rather than the Guiana rain-forest, which is characterised by so many important endemic species only a very few of which extend into the forest of this district.

## LII—MISCELLANEOUS NOTES.

H. R. BRITON-JONES.—We regret to record the death of Professor H. R. Briton-Jones, Ph.D., D.Sc., which took place in Trinidad after an operation for appendicitis, at the early age of 43.

Harry Richard Briton-Jones was a student at the Royal College of Science in 1914, and at the outbreak of war had just gained the A.R.C.S. and had started on post-graduate work. He returned to the College in January 1918, having served with distinction in the R.G.A. In the autumn of 1919 he came to Kew for a course in tropical mycology preparatory to taking up the post of Mycologist to the Ministry of Agriculture, Egypt. After three years in Egypt he returned to England as Mycologist at the Horticultural Research

Station, Long Ashton, and from there he proceeded in 1926 to Trinidad as Professor of Mycology at the Imperial College of Tropical Agriculture.

Briton-Jones was essentially a plant pathologist rather than a mycologist, and his work throughout is characterised by its grip of the practical and economic side. In Egypt his most important piece of work was concerned with the disease known as "sore shin" of cotton, an account of which is given in Bulletin 49 of the Ministry of Agriculture, Egypt ("Mycological Work in Egypt during the period 1920-1922"). At Long Ashton his attention was naturally turned to diseases of fruit trees, and he developed the standpoint that the health of the host plant is usually the primary factor determining whether the attack of parasitic organisms shall succeed. It was the importance of this aspect of approach to his subject which led to his study of horticulture, and before leaving for Trinidad he took his D.Sc. in that subject at the London University. This viewpoint came out more strongly in connexion with his observations on root-diseases in the West Indies, and is again emphasized in his book, "The Diseases and Curing of Cacao," published in 1934 (see review in K.B. 1935, 161-162).

As a pupil and as a colleague Briton-Jones was very much liked, though his impulsive Celtic temperament sometimes brought him into opposition, temporarily, with more cautious individuals.

As Dean of the College for the past nine years he rendered valuable service and was very popular with the students year by year. Being a keen Rugby Football player, a good sportsman, and a gentleman in every sense of the term, he occupied a position of confidence and responsibility among the students in the College which it will be difficult to fill. His untimely death is a great sorrow to his many friends.

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CEDRIC ERROL CARR.—Mr. Carr was the only son of the late John Thomas Carr, C.E., and was born at Napier, New Zealand, on November 16, 1892. At the age of 7 he went with his parents to England and was educated at Dulwich College. He came to Malaya in January 1913 as an assistant on Kulong Rubber Estate, Malacca, but returned to England in 1916 for military service, and was wounded severely at Arras in July 1917 and again in August 1918. He returned to Malaya in 1919, becoming manager of Lendu Estate, Malacca, and then of Tembeling Estate, Pahang, until 1931.

From his boyhood Carr took a great interest in British orchids. When he went East he began to study the orchids of Malaya, and soon became familiar with the species of the Malaccan countryside, but it was not until he went to Pahang that he began the intensive study which continued to his death. The isolation of Tembeling, in the midst of some of the richest forest in Malaya, brought Carr into more intimate contact with tropical nature, and he was overwhelmed by the richness and variety of the orchid flora. He took frequent

expeditions into the surrounding country and brought plants alive to his garden at Tembeling, where he watched them flower. He collected and grew in this way some 400 local species. He early made a careful study of pollination and other aspects of floral biology, which was embodied in a paper published in the "Journal of the Malayan Branch, Royal Asiatic Society," in 1928. The writing of this paper brought Carr into contact with the staff of the Botanic Gardens, Singapore, and for the next few years visits were interchanged, to our mutual advantage. Carr made full use of the Gardens, library and herbarium, and Tembeling became a centre for botanical expeditions, which greatly enriched our knowledge of the Malayan flora. Carr's own collections added somewhere about 100 species to the known orchid flora of the Peninsula. He was particularly interested in small plants, and of the genus *Taeniophyllum* added thirteen species to the four previously known. His papers, in which the new species are described, were published in the "Gardens Bulletin S.S."

After leaving Tembeling, Carr undertook an expedition to Mount Kinabalu in British North Borneo, where (in addition to a great variety of other plants) he collected some 700 species of orchids, a large proportion of which he considered to be new. Unfortunately he did not live to complete the description of these collections. He went to England in 1933 and worked for a time in the Kew herbarium, leaving at the end of 1934 for his Papuan expedition, which was in sight of successful completion when he fell ill with blackwater fever. He was conveyed 100 miles by aeroplane to Port Moresby, where he died in hospital on June 3, 1936. The Papuan expedition covered a considerable variety of country concluding with seven months on Mount Victoria, and the serial numbers of collections reached a total of about 7,000.

Thus the botanical world has lost in his prime a man who gave promise of becoming one of the leading orchid systematists, and a field worker of outstanding ability. Indeed, it was in the field that one got the true measure of Carr as a naturalist, and felt something of the absorbing passion he had for his work.

R. E. HOLTUM.

**Hydnocarpus Wightianus** in Nigeria. In the article by Mr. J. D. Kennedy on this subject in K.B. no. 6, 1936, it was stated (p. 344) that the report on a sample of seed sent to the Imperial Institute for analysis had not yet been received. Since this was written the report has been made and published in the "Bulletin of the Imperial Institute," 34, no. 2, pp. 146-151 (1936).

# BULLETIN OF MISCELLANEOUS INFORMATION Appendix 1936 ROYAL BOTANIC GARDENS KEW

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## REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1936.

### General

**STAFF.**—MR. W. DALLIMORE, I.S.O., V.M.H., retired from the post of Keeper of the Museums on March 31st, 1936. Dr. J. HUTCHINSON, F.L.S., Botanist in the Herbarium, was appointed to succeed him (K.B. 1936, 189).

MR. H. K. AIRY-SHAW, Assistant Botanist in the Herbarium, was appointed to the post of Botanist as from April 1st, 1936. Mr. A. A. BULLOCK was appointed to succeed him as from June 30th, 1936.

Miss I. M. DAVIDSON was appointed to the new post of Sub-Assistant in the Library as from October 3rd, 1936.

Miss H. M. L. FORBES, Botanical Assistant in the Department of Agriculture and Forestry, S. Africa, has been transferred by that Department to the Herbarium for a period of one year, beginning June 22nd, 1936.

MR. A. S. WILSON, Assistant Curator in charge of the Greenhouse and Ornamental Department, resigned his post on 31st December, 1936, to take up the appointment of Head Gardener to the Maharajah of Cooch Behar.

THE DIRECTOR was awarded the Grande Médaille à l'effigie d'Isidore Geoffroy St. Hilaire by the Société Nationale d'Acclimatation de France and received it in person in Paris on March 29th. On December 21st, at the Annual General Meeting of the New York Academy of Sciences, he was elected an Honorary Member of the Academy.

DR. HUTCHINSON was elected an Honorary Fellow of the American Amaryllis Society and a Correspondent of the Academy of Natural Sciences of Philadelphia.

**OFFICIAL VISITS.**—THE DIRECTOR represented the Royal Botanic Gardens, Kew, as the official delegate at the Centenary Celebrations of the University of London (June 29th) and the Centenary Celebrations of the Botanical Society of Edinburgh (July 1st) and presented addresses (see K.B. 1936, 393).

THE ASSISTANT DIRECTOR attended the meeting of the British Association at Blackpool in September and read a paper.



**PUBLICATIONS.**—Ten numbers of the "Kew Bulletin" were published during the year, and the Review of the work during 1935 was issued as an Appendix. The "List of Seeds" was published as a separate pamphlet.

A new booklet of 12 coloured views of the Gardens with descriptive titles was published (price 1s. 6d.) and eight new coloured postcards were issued. The "Illustrated Guide to the Gardens" was re-issued with several new photographs.

"The Cultivated Races of Sorghum" by Mr. J. D. Snowden was published in May by the Bentham-Moxon Trustees (see Annual Review, 1935, 636).

Part 2 of "The Flora of the Presidency of Madras" and vol. 2, part 2, of "The Flora of West Tropical Africa" were published in February.

## The Gardens

**VISITORS.**—The number of visitors to the Gardens in 1936 was 1,128,660—weekdays (except students' days) 548,981; students' days 77,092; Sundays 502,587—an increase of 37,440 as compared with the figures for 1935, due largely to fine weather during the months of May and August. The greatest monthly attendance was in May with 251,949, and the lowest in December with 10,080. The highest daily attendance was 59,858, on Whit Monday, June 1st; the lowest was 13 on January 16th.

**GENERAL.**—The weather during 1936 included no long dry spells but was more or less showery throughout the year. This entailed less watering than in recent years, 22,800,000 gallons being used, as against 25,600,000 in 1935. In spite of this many of the larger trees still show the effect of droughts during the last few years. Their top branches are thin and bare and it is doubtful if some of them, especially beeches, will ever fully regain their former vigour.

The flagstaff is now the tallest in the Empire. We learn that the pole in front of the Court House at Vancouver, which just overtopped the Kew pole, has had to be removed on account of decay.

**ARBORETUM.**—The extension to the north-east side of the Bamboo Garden, referred to in the report for 1935, has been completed.

A further clearance of shrubs near the large group of evergreen oaks close to the North Gallery has been effected, and the *Staphylea* collection has been transferred to a new position on the south side of the flagstaff mound. The effect is to show to the best advantage what is one of the finest tree groups in the Gardens. Overcrowding in the *Euonymus* collection called for rearrangement, which has been carried out with good results.

The large transplanting machine which had been in use for some 80 years, and which had become worn out beyond repair, has been replaced by a new machine of similar type, but incorporating several improvements.

In the Arboretum Nursery, the old line of span-roofed frames, used for Temperate House plants, has been replaced by a new span-roofed pit, with a central path, resulting in better working conditions.

**TEMPERATE HOUSE.**—For some years the roof has leaked, causing considerable damage to the plants. During the past summer re-roofing was commenced. The lower roof on the west side of the house was reconstructed, western red cedar being used, and was glazed with larger panes of glass and fitted with continuous ventilators at top and bottom. This gives better ventilation and increased light. It is expected that the plants will greatly benefit thereby. The work is to be continued until the whole of the central portion of the house has been re-roofed

*Lobelia Gibberoa* flowered during the summer, reaching a height of nearly 30 ft.

**TROPICAL DEPARTMENT.**—Palm House. The interior of the north wing has been repainted and the panes of tinted glass have been replaced with clear glass. At the same time all the hot water pipes beneath the side stages in the north end of the house were thoroughly overhauled, reconditioned and rearranged, an opportunity which allowed the construction of a bed better suited to the requirements of climbing plants. The stages have been reconstructed and so arranged that greater depth of shingle can be used for the retention of moisture.

**T Range.**—The preliminary experiments carried out last winter in connection with the injury to plants caused by fog are being continued, and to facilitate this work an electric power cable has been laid to the T Range, so as to operate fans in the Begonia and Orchid houses. A neon lamp has also been installed in House 14C (see p. 553).

**South African House.**—The planting has been completed and practically all the plants appear to be well established and growing freely. This is due, no doubt, to the provision of adequate root run which affords natural and equable conditions.

**Melon Yard.**—The Tropical Propagating Pits 17A and B, the roofs of which were beyond repair, have been entirely reconstructed and converted into one house, with central and side stages built of reinforced concrete. There has been a complete rearrangement of the heating system, including overhead heating, and tanks for rain water and for the cultivation of aquatic plants have been

provided. Western red cedar was employed for the wood work. The new house provides improved cultural conditions.

Electric light has been installed in the Tropical and Decorative potting sheds, offices and stores.

*Beloperone guttata*, exhibited at the Royal Horticultural Society on September 29th, 1936, was given an Award of Merit, and later in the year was awarded the Sander Medal for the best greenhouse plant exhibited during 1936.

**HERBACEOUS DEPARTMENT.**—Several small sections of the Rock Garden have been rebuilt and fresh compost introduced. Amongst the most interesting plants flowered in 1936 were *Caltha sagittata* and *Ranunculus uniflorus* from Tierra del Fuego; *Fritillaria* spp., including *F. Purdyi*, *F. Olivieri*, *F. oranensis* and *F. biflora*; *Penstemon Adamsianus*, *P. Smallii*, *P. Roetzlii* and *P. Jaffrayanus*; *Primula bellidifolia* and *P. Sherriffae*, both collected by Messrs. Ludlow and Sherriff; *Digitalis Mariana* collected by Mr. E. K. Balls; *Campanula maroccana* and *Linaria lurida* from the Atlas Mountains, collected by Mr. J. Gattefossé; *Gentiana pedicellata* from the Himalayas, and *Gentiana Makinoi* from Japan.

**STUDENT GARDENERS.**—The recent lessening of the economic depression has not yet had sufficient time to show any appreciable reaction on the movements of students, but the number of men (fifteen) who completed their training and secured appointments is a slight advance on 1935.

**Outgoing Students.**—In this country five appointments were secured in Parks Departments, a similar number in nurseries or private gardens, and one with the Middlesex County Council. Overseas there were three appointments as follows: Cyprus (private garden); Bahrain Islands, Persian Gulf (Californian Standard Oil Co. Ltd.); Trinidad (Botanic Garden); and one student returned home to South Africa.

**Incoming Students.**—Fifteen men (all British subjects) were recruited as follows: Parks Departments (six), nurseries and private gardens (four), John Innes Horticultural Institution (one), Cambridge Botanic Garden (one), Sheffield Education Committee (one). One student returned from La Mortola, and another from Spain (Cap Roig), the period in the latter case being shortened owing to the disturbed state of the country.

Eight students (double the number of the previous year) visited overseas countries through exchange arrangements made with the following botanical and horticultural establishments:—

The Ontario Agricultural College, Guelph, Canada; the New York Botanical Garden; the Arnold Arboretum; the Berlin Botanic Garden; Sans Souci Gardens, Potsdam; Luxembourg Gardens, Paris; and trade nurseries in New Zealand and Switzerland.

In addition two students from Great Britain, one from India, four from Holland, and one from Norway, worked in the Gardens as voluntary students for varying periods.

#### RAINFALL RECORD.

Rainfall recorded at the Royal Botanic Gardens, Kew, during 1936 :—

	Inches.		Inches.
January ... ..	3·87	July... ..	2·32
February ... ..	1·53	August ... ..	·41
March... ..	·80	September ... ..	2·28
April ... ..	1·43	October ... ..	1·60
May ... ..	·48	November ... ..	2·83
June ... ..	3·44	December ... ..	1·44

Total 22·43 inches.

The total for 1935 was 24·52 inches.

**WATERFOWL.**—Mr. A. Ezra of Foxwarren has very generously presented a male Stanley crane to replace the one sent over from Pretoria in 1935 which, unfortunately, died during the summer ; he also gave a female carolina to complete our pairs of these ducks. A pair of South African shellduck was received as a present from St. James's Park. The following additions to the collection were, received by way of exchanges : one pair garganey teal, one pair shovellers, two female carolinas, one pair chili teal and one pair cinnamon teal.

During the year 105 grey squirrels have been shot—but unfortunately they have not yet been exterminated—and 66 rats have been destroyed.

**CONTRIBUTIONS TO THE GARDENS, 1936.**—The following is a summary of the items of most interest amongst the 1020 separate consignments of plants, bulbs, seeds, etc., received during the year :—

#### *Public Institutions :—*

Amani, East African Agricultural Research Station.—Seeds, including *Impatiens Oliveri* and *Edithcolea* sp., and bulbs of *Bowiea kilimandscharica*, collected and forwarded by Mr. P. J. Greenway.

Berlin, Botanic Garden.—A large collection of seeds.

Cambridge, Botanic Garden.—Alpine, herbaceous, aquatic and stove plants ; seeds of *Callitris oblonga* and *C. rhomboidea* from Tasmania.

Canton, Sun Yatsen University.—Seeds of *Zenia insignis*, gen. & sp. nov.

Chelsea Physic Garden, London.—Plants, including *Alsophila*, *Nepenthes* and *Streptocarpus* spp.

- Christchurch, New Zealand, Botanic Garden.—101 packets of seeds.
- Coimbra, University Botanic Garden.—Seeds, fern spores and cuttings.
- Concepcion, University Botanic Garden.—Seeds, including *Puya alpestris*. Plants of *Sarmienta repens* and *Polypodium Feuillei*.
- Darwin, Northern Territory of Australia, Botanic Gardens.—Seeds of *Cycas media* packed in fresh seed of *Callitris intratropica*.
- Dehra Dun, Forest Research Institute.—Several consignments of seeds, also bulbs and rhizomes.
- Dresden, Botanic Garden.—81 packets of seeds.
- Dunedin, Botanic Gardens.—Plants and seeds.
- Edinburgh, Royal Botanic Garden.—Plants, including *Nepenthes*, *Hoya*, *Gentiana*, *Medinilla*, *Primula*, *Saurauja* and *Pratia* spp. ; also various seeds, including *Bejaria* (*Befaria*) *racemosa* from Florida, and a consignment sent home by Forrest's collectors, distributed at the request of Lord Aberconway.
- Falkland Islands, Government House, Port Stanley.—Plants, including *Leucera gossypina*, *Pernettya pumila* and *Blechnum penna-marina*.
- Federated Malay States, Department of Agriculture, Kuala Lumpur.—Wardian case of plants of *Nephelium lappaceum* (for re-shipment, when in a fit condition, to Trinidad).
- Glasnevin, Botanic Garden.—Plants, seeds and cuttings.
- Gold Coast, Department of Agriculture, Accra.—A shipment of plants, tubers and seeds ; also tubers of orchids (from Kumasi).
- Gold Coast, Forestry Department, Kumasi.—Fruits of *Antrocaryon micraster*.
- Grahamstown, Albany Museum Herbarium.—Bulbs of *Drimia Hawthorthioides* and *Faucaria Gratiae*.
- Hamburg, University Botanic Garden.—A shipment of stove, decorative and insectivorous plants.
- Hong Kong, Botanical and Forestry Department.—A Wardian case of plants of *Saururus*, *Houttuynia* and *Gymnotheca* species ; seeds, including *Camellia*, *Quercus* and *Tutcheria* spp.
- Hong Kong, Department of Biology, The University.—A Wardian case of plants, including species of *Tutcheria*, *Schima*, *Gordonia*, *Homalium*, *Acanthophippium* and *Camellia* species.
- Hyde Park, London.—Plants and seeds.
- John Innes Horticultural Institution, Merton.—Plants of *Calceolaria*, *Primula*, *Pelargonium* and *Streptocarpus* species.
- Innsbruck, Botanic Garden.—Seeds of *Viscum album* grown upon *Pinus montana* and *Abies pectinata*.
- Jamaica, Hope Gardens.—A Wardian case of ferns collected in the mountains at 5,000 ft.

- Khartoum, Forestry Department.—Plants of *Pelargonium*, *Caralluma*, and *Kniphofia* species.
- Khartoum, Government Gardens.—Seeds, corms and a shipment of plants.
- Kimberley, McGregor Memorial Museum.—Seeds of *Ammocharis*, *Nerine*, *Hermannia* spp., etc.
- Kirstenbosch, Bolus Herbarium.—Plants and cuttings, including species of *Stomatium*, *Rhinephyllum*, *Chasmatophyllum* and *Bergeranthus*; also plants of 7 species of *Faucaria*—which were collected by Dr. C. L. Leipoldt at the Oograbies Falls.
- Kirstenbosch, National Botanic Gardens.—Plants, including *Hemitelia capensis* and *Pelargonium rapaceum*, and several consignments of seeds.
- Körnack, Gardens and Arboretum.—Plants, including *Betula carpartica*, *B. Hoseri*, *Tilia diversifolia* and *Acanthopanax Henryi* var. *nana*.
- Leningrad, Botanic Garden.—Seeds.
- Madras, Government House Gardens.—Wardian case of plants, seeds of trees and shrubs.
- Madrid, Botanic Garden.—43 packets of seeds.
- Moscow, All Union Research Institute of Agricultural Forest Melioration and Forest Management.—Seeds of trees and shrubs.
- Munich, Botanic Garden.—83 packets of seeds and fern spores.
- Nairobi, Coryndon Memorial Museum.—Seeds of *Caralluma* sp. nov. ?
- Nanking, Botanic Garden of Dr. Sun Yatsen's Memorial Park.—174 packets of seeds collected in Szechuan, comprising many interesting species and genera.
- New York, Botanic Garden.—A collection of Begonias, varieties of *Verbena canadensis*, and seeds—various.
- New Zealand State Forest Service, Wellington.—A collection of seeds of New Zealand indigenous species.
- Oxford, University Expedition to Sarawak, 1932.—Seeds of a new Rubiaceae plant allied to *Neurocalyx*.
- Paris, Muséum national d'histoire naturelle.—A collection of orchids and stove plants.
- Penang, Gardens Department.—A Wardian case of plants including species of *Cyathea*, *Mesochlaena*, *Dipteris*, and *Nephrolepis*; spores of *Dipteris* and *Gleichenia* spp.
- Port Elizabeth, Parks and Town Attractions Department.—Seeds, including *Gethyllis*, *Amorphophallus*, *Encephalartos*, and *Pelargonium* spp.
- Pretoria, Division of Plant Industry.—Seeds of *Stapeliae* and *Alberta magna*.
- Rio de Janeiro, Botanic Garden.—Plant of *Gymnocalycium denudatum*.

Singapore, Botanic Gardens.—A Wardian case of orchids ; seeds and fern spores including species collected in the Cameron's Highlands.

Stellenbosch, University Botanic Gardens.—Seeds—69 packets—including *Roridula Gorgonias*.

Taschkent, Botanic Garden of the University of Middle Asia.—Seeds.

Tokyo, University Botanic Garden.—Seeds.

U.S. Department of Agriculture, Washington.—Seeds, including economic subjects from Coconut Grove, Florida.

Westonbirt, The Arboretum.—Plants—a collection of species and varieties of *Acer*, also *Aronia arbutifolia* var. *erecta*.

Wisley, Royal Horticultural Society's Gardens.—Plants, cuttings, seeds and bulbs.

Wuchang, Hupeh, Wu-Han University.—Fruits of *Poupartia chinensis*, procured by Prof. H. H. Chung.

*Private Donors :—*

Mr. Edwin Ashby, Blackwood, South Australia.—Seeds, including *Kunzea ambigua* and *Casuarina stricta*.

Mr. E. K. Balls, Knebworth.—Plants of *Iris Histrio* var. *aintabensis* ; collections of seeds, bulbs and plants from Morocco.

Mr. Geoffrey Beal, Chatham, Ontario.—Seeds of *Asim. app. triloba* and *Nelumbo lutea*.

Col. C. Beddington, London.—Seeds of *Lithospermum* spp., bulbs and tubers from Palestine ; cactus seedlings.

The Brookside Nurseries, Ltd., Headington, Oxford.—Rare plants, *Daphne petraea* var. *grandiflora*, and a collection of named varieties of *Helianthemum*.

Mr. C. S. Causdale, C/o Imperial Forestry Institute, Oxford.—Ground orchids and *Crinum*s from Afram Plains, N.E. Ashanti.

The Right Hon. Neville Chamberlain, M.P., London.—Orchids—a large collection of species and varieties of *Masdevallia*.

Mrs. E. M. Cheatham, Hawaii.—Seeds and tubers of *Begonia sandwicensis*.

Mr. R. B. Chillas, Jnr., Germantown, Philadelphia.—Seeds, including *Amianthium muscaetoxicum*, a very rare species.

Col. Stephenson R. Clarke, Haywards Heath.—Plants, including species of *Acer*, *Pyrus* and *Quercus*.

Messrs. W. A. Constable Ltd., Tunbridge Wells.—Bulbs of *Lilium* spp. and varieties.

Mr. J. Davis, Belmore, New South Wales.—Fern spores.

Mr. L. Denny, Strawberry Hill, Middlesex.—Large collections of cacti and succulents.

Dr. A. Ducke, Manaos, Brazil.—Seeds of *Einsteinia sericantha*.

Mr. Selwyn Duruz, Wallington.—A choice collection of orchids, and plants of *Pinguicula* and *Hippeastrum* spp.

- Mr. J. E. Edwards, Gibraltar.—Plants of *Viola arborescens* and *Orchis speculum*.
- Mr. T. M. Endean, Laindon.—A collection of South African succulents.
- Captain Esme Erskine, C/o Foreign Office, London.—Seeds and tubers from Western Abyssinia.
- Mrs. G. Foggitt, Thirsk.—British plants, originally from wild localities.
- Mr. G. B. Foote, Puwakpitiya, Ceylon.—Plant of *Coelogyne Rochussenii*.
- Mrs. H. A. Fowler, Winnipeg.—Several consignments of seeds ; plants of *Cypripedium*, *Polygala*, *Meriolix* and *Aster* spp.
- Lady Game, Ham Common.—A collection of orchids.
- H.R.H. The Duke of Gloucester.—Seeds of *Eucalyptus* and *Acacia* species.
- Mr. B. J. Gould, Lhasa, Tibet.—A collection of plants from the Sikkim-Tibet border.
- Mr. H. Harris, Richmond, Surrey.—Orchids, fruits and seeds collected in the Amazon river valley.
- Miss Thistle Y. Harris, Sydney.—A consignment of ferns, and a collection of Australian fruits and seeds.
- Count Hirotaro Hayashi, Tokyo.—74 packets of seeds.
- Messrs. Henry A. Heys & Co., Wimbledon.—Two cases of *Lilium* bulbs.
- Messrs. Hillier & Sons, Winchester.—A large collection of trees and shrubs.
- Mr. G. B. Hinton, Mexico.—A collection of plants including orchids, *Gentiana salpinx*, *Selaginella lepidophylla*, also many consignments of miscellaneous seeds.
- Hocker Edge Gardens, Cranbrook.—A collection of plants, bulbs and rhizomes, including *Iris nigricans* and *I. atropurpurea* collected by Col. C. H. Grey.
- Lady Hosie, Oxford.—Seeds of *Osmosia Hosiei* and of a weeping variety of *Ginkgo biloba*, from Szechwan, China, collected by Mr. S. Dye, a Canadian Scientific Missionary.
- Mr. G. P. Ingram, Barhan, United Provinces, India.—Roots of two ferns and ? *Potentilla* sp.
- Mr. W. A. Ingram, Ballykelly, Ulster.—Seedlings and seed of species and varieties of *Echium*.
- Messrs. W. E. Th. Ingwersen, Ltd., East Grinstead.—A collection of alpine plants.
- Messrs. George Jackman & Son, Woking.—Plants, including a collection of named varieties of *Clematis*.
- Mr. W. A. Knight, St. Augustine, Fla., U.S.A.—Seeds of the very rare *Elliottia racemosa*.
- Mr. C. H. Lankester, Costa Rica.—Plants and seeds, and a splendid collection of orchids.



- Mrs. J. R. Leach, Portland, Oregon.—Plants of *Kalmiopsis Leachiana* (a very rare species), and *Bensonia oregona*.
- Dr. F. Lemperg, Hatzendorf.—Plants and seeds, many of which were collected during his 1936 expedition to Albania and Serbia.
- Mr. H. Q. Levy, Brown's Town, Jamaica.—Two consignments of orchids, including *Laelia monophylla* and *Comporetta falcatum*.
- Lady Loch, London.—Plant of *Chrysanthemum japonicum* var. *sibiricum latilobum*.
- Mr. W. J. Marchant, Stapehill, Wimborne.—Shrubs, also plants of *Shortia uniflora* var. *grandiflora*, and *Phyllodoce hybrida*.
- Mr. W. E. Marriott, Durban.—Two plants of *Encephalartos Ghellinckii* (collected on the Drakensberg) forwarded through the Natal Herbarium.
- Mr. E. M. Massam, Ndola, Northern Rhodesia.—Tubers and seeds of *Begonia Homblei*.
- Mr. H. E. Maude, Gilbert Islands.—Seeds of *Boerhaavia*, *Euphorbia*, *Sida* and *Triumfetta* spp.
- Mr. F. W. Millard, East Grinstead.—Alpine and herbaceous plants.
- Lord Moyne, London.—Orchids, including *Gramatophyllum*, *Dendrobium* and *Spathoglottis* spp.
- Mr. H. Murdock, Queens Park, Western Australia.—A large and interesting collection of seeds of indigenous plants.
- Capt. Neil McEchearn, Pallanza.—A collection of Cannas.
- Miss G. M. Newton, Thetford.—Roots of the butterfly orchis from a plantation soon to be the site of an aerodrome.
- Mr. D. J. Oman, Rustington.—Plants, *Crinum giganteum*, *Nephrolepis rufescens* (?) and *Polypodium Phymatodes*.
- Mr. J. Overall, Sulphur Creek, Tasmania.—29 packets of seeds, including *Fagus Cunninghamii*.
- Mr. Otto C. Overbeck, Salcombe.—A collection of Stapelias—25 spp.
- Dr. L. R. Parodi, Buenos Aires.—Seeds of *Oryza subulata*, a very rare grass.
- Messrs. Perry's Hardy Plant Farm, Enfield.—A choice collection of aquatic plants from Florida ; corms and seeds.
- Mrs. J. B. Priestley, Highgate Village.—Seeds of *Atriplex hymenelytra* and *Enceliopsis Covilleii* from Death Valley.
- Mr. D. Pringle, Port Elizabeth.—A collection of succulents, forwarded to Kew in the care of Mrs. A. Turner, Felixstowe.
- Mr. C. A. Purpus, Vera Cruz, Mexico.—Interesting consignments of plants, bulbs and seeds.
- Dr. W. Rama, Madagascar.—Orchids, including *Angraecum*, *Grammangis*, *Cymbidiella* and *Eulophiopsis* spp.
- Mr. G. C. Reynolds, Johannesburg.—Seeds of *Aloe polyphylla* from the type locality.

- Mr. C. Gilbert Rogers, Etchingham, Sussex.—Seeds and corms of *Homoglossum Watsonioides* from Mt. Kilimanjaro ; seeds from California collected by Mr. F. Nutter Cox.
- Hon. Mrs. E. F. Ryder, Beaulieu.—A collection of succulents and cuttings of *Swainsonia galegifolia*.
- Messrs. Sanders, St. Albans, Ltd.—Orchids and tubers.
- Mr. F. D. Sandeman, Kingennie, Angus.—Plants and seeds of *Primula* spp., including *P. Winteri*.
- Dr. H. Schaefer, Sumatra.—Tubers of *Amorphophallus titanum*.
- Mr. H. B. Sharp, Rumuruti, Kenya Colony.—Seeds and bulbs collected near Lake Rudolf and on Mt. Nijiro.
- Mr. H. W. Simmonds, Tunbridge Wells.—Plants of *Hibiscus* species from Fiji.
- Mr. Herbert J. Solomon, Sydney.—Plants of the exceedingly rare *Rhododendron Lochae*.
- Sir Aurel Stein, Kashmir.—A consignment of seeds from the Vale of Kashmir.
- Major F. C. Stern, Goring-by-Sea.—A collection of *Iris* ; plants, cuttings, and seedlings.
- Mr. H. L. Stinson, Seattle, Washington.—Seeds of *Iris Douglasiana* (dwarf form), *I. tenax*, *I. tenax* x *I. Douglasiana* (from West Oregon), and *Fraseria speciosa*.
- Mrs. Symes, Warninglid, Sussex.—Seeds from Mt. Everest.
- Mr. R. S. Trickett, Ealing.—Plants, including a magnificent specimen of *Viburnum Carlesii*.
- Mr. A. C. Trott, Tehran.—Seeds, bulbs and rhizomatous plants from Iran.
- Mrs. A. Turner, Felixstowe.—A collection of succulents from South Africa, assembled by Mr. D. Pringle, Port Elizabeth.
- The Executors of the late Lord Wakehurst, Ardingly.—Plants, including *Machilus ichangensis*, a rare species ; *Chusquea andina* and *Drimys Winteri* var. *latifolia*.
- Mr. F. A. Weinthal, Roseville, N.S.W.—Plants, including *Dendrobium*, *Cymbidium* and *Sarcochilus* spp. ; seeds of *Drosera* and *Stylidium* spp.
- Lord Wigram, Windsor.—A collection of seeds from Nepal.
- Mr. G. E. Wolstenholme, La Paz, Bolivia.—A consignment of tubers, red, yellow and white, of *Oxalis tuberosa* ; seeds of *Tropaeolum Seemannii* and *Cajophora* sp.
- Mr. R. W. Younger, Magallanes.—Seeds.

DISTRIBUTION OF PLANTS AND SEEDS.—At the commencement of the year the annual distribution of seeds resulted in 184 separate consignments being despatched, comprising 5,468 packets of herbaceous plants and 4,510 packets of trees and shrubs. The aggregate shows a slight decrease (57 packets) as compared with the previous year.

Special distributions were made of plants of *Loxsonia Cunninghamii*, and seeds of *Ammocharis coccinea*, *Zea Mays*, *Viscum album*, *Nerine lucida*, *Arbutus Menziesii*, *Cornus Nuttallii*, *Cornus florida*?, *Crossandra undulaefolia*, *Dendromecon rigidum*, *Camellia hongkongensis*, and *Aloë polyphylla*.

Overseas shipments of plants were as follows:—Agricultural Departments of Jamaica, Trinidad, and St. Helena. Botanic Gardens of New York, Singapore and Trinidad; Government Gardens, Khartoum; Government House, Cyprus; H. E. the Governor of Bihar and Orissa; Imperial College of Tropical Agriculture, Trinidad; British Consulate, Lourenco Marques; East African Agricultural Research Station, Amani; Parks and Gardens, Department, Cape Town; Department of Biology, Hong Kong University; Bolus Herbarium, Kirstenbosch, and the Borough of Port Chalmers, New Zealand.

Other recipients of plants, etc., included the following:—

*Institutions* :—

Admiralty Compass Observatory, Slough.—A collection comprising 30 plants of *Populus* spp. and vars.

Amani, East African Agricultural Research Station.—Plants of *Lonchocarpus nicou*.

Arnold Arboretum, Atkins Institute, Cuba.—A collection of *Euphorbia* spp.

Arnold Arboretum, U.S.A.—Hardy trees and shrubs.

Berlin, Botanic Garden.—A collection of orchids; grafts and cuttings of hardy trees and shrubs.

Bristol, Corporation Parks Department.—A collection of 250 plants, principally temperate subjects.

Cambridge, Botanic Garden.—A collection of *Nepenthes* spp. and stove subjects; plants, cuttings and tubers of Nymphaeas.

Chelsea Physic Garden, London.—Plants, including *Dicksonia Wendlandii*.

Copenhagen, University Botanic Garden.—Hardy trees and shrubs.

Dunedin, Botanic Gardens.—99 packets of seeds.

Edinburgh, Royal Botanic Garden.—Plants and seeds, including *Camellia maliflora* and *Nepenthes bicalcarata*.

Egypt, The Egyptian University, Cairo.—150 packets of seed of herbaceous and alpine plants.

Eton College, Windsor.—*Lilium* spp., and aquatics.

Gibraltar, Government House Gardens.—A collection of bulbous plants and cuttings of *Penstemon* spp.

Glasgow, Parks Department.—A collection of seedling Mexican oaks.

Glasnevin, Botanic Garden.—Plants of *Erlangea pulchra*.

Green Cross Society, London.—Seeds of British native plants.

The Hague Public Parks, Holland.—Grafts and cuttings of hardy trees and shrubs.

Hamburg, University Botanical Institute.—A collection of *Nepenthes* and filmy ferns ; seeds of *Lilium* spp. and *Rhododendron* spp.

Holloway, H. M. Prison.—A collection of herbaceous plants.

Imperial War Graves Commission, Arras, France.—Plants of *Eucalyptus coreacea* and *Cupressus arizonica*.

John Innes Horticultural Institution, Merton.—Plants, including *Nepenthes* spp.

Jamaica, Hope Gardens.—A collection of named varieties of *Dahlias* and miscellaneous plants.

Kew Observatory, Richmond.—Trees, shrubs and herbaceous plants.

Kiel, Botanic Institute.—A collection of *Pelargonium* spp.

Kingston-on-Thames, Cambridge Home for Soldiers' Widows.—A collection of flowering shrubs.

Leningrad, Botanic Garden.—Seeds, including *Victoria regia*.

Lisle, Morton Arboretum, U.S.A.—A collection of grafts and cuttings of hardy trees and shrubs.

London Passenger Transport Board.—Collection of Fuchsias and Irises.

Metropolitan Police College, Hendon.—Trees and shrubs.

Middlesex County Council, Roads Department.—Plants of *Berberis lologensis* and *Cotoneaster serotina*.

Moscow, University Botanic Garden.—Plant of *Victoria regia*.

New York, Botanic Garden.—Seeds of *Victoria regia* and a collection of *Saxifraga* spp.

Oslo, University Botanic Garden.—A collection of orchids and stove plants.

Paris, Muséum national d'histoire naturelle.—A collection of orchids.

Salford, Parks Department.—Stove, economic and aquatic plants.

Singapore, Botanic Gardens.—A collection of Rhododendrons.

St. Helena, Agricultural and Forestry Office.—A collection of named varieties of oil-producing lavenders.

Sydney, N.S.W., Department of Agriculture.—Seeds, including *Allium* spp., alpine and herbaceous plants.

Trinidad, Department of Agriculture.—Rambutan plants ; received from Federated Malay States.

Trinidad, Imperial College of Tropical Agriculture.—Musas in variety.

Trinidad, Royal Botanic Garden.—Plants, seeds and corms.

Washington, United States Department of Agriculture.—Plants of *Arundinaria* spp.

Zoological Society, Regent's Park.—A collection of stove plants.

*Private Recipients :—*

- Sir F. D. Acland, Bart., Killerton, Devon.—Seedling *Rhododendrons*.
- Mr. J. Adlard, East Horsley, Sussex.—*Nymphaeas*.
- Mr. D. J. Bethell, Englefield Green.—Plants including *Sparmannia africana* and *Cestrum Newellii*.
- Dr. R. Bevan, Henley-on-Thames.—Herbaceous and alpine plants.
- Viscount Bledisloe, Lydney Park, Glos.—*Aesculus indica*.
- General Sir Walter Braithwaite, Royal Hospital, Chelsea.—Plants of *Aesculus indica*.
- The Brookside Nurseries Ltd., Headington, Oxford.—Hardy trees and shrubs ; alpine and herbaceous plants.
- Messrs. Burkwood & Skipwith, Kingston-on-Thames.—Hardy trees and shrubs.
- Lt.-Col. the Rt. Hon. H. H. Spender-Clay, Lingfield, Surrey.—Plants, including *Erica Pageana*, *Libertia ixioides* and *Aesculus indica*, also a collection of Camellias.
- Prof. Valeria Colmegna, Como, Italy.—Seeds of *Lilium* spp.
- Dartington Hall, Totnes.—Plants and seeds.
- Mr. L. Denny, Strawberry Hill, Middlesex.—A collection of stove plants.
- Donard Nursery Co., Newcastle, Co. Down.—Grafts of *Hamamelis mollis* and hardy shrubs.
- The Very Rev. The Dean of Durham.—A collection of shrubs, including Rhododendrons in variety.
- Mr. C. Eley, East.Bergholt.—A collection of conifers.
- Mr. A. S. Elson, Bahrain Island, Persian Gulf.—A collection of seeds, and plants of *Mesembryanthemum* spp.
- Mr. R. G. Evans, Roundhill, Nova Scotia.—A collection of border Chrysanthemums.
- Mr. W. Arnold Forster, Zennor, St. Ives.—Camellias.
- Mrs. H. A. Fowler, Winnipeg.—Plants of *Gentiana Farreri* and *G. sino-ornata*.
- Lady Game, Ham Common.—Succulents and a plant of *Brunfelsia calycina* var. *macrantha*.
- Mr. J. A. Gellatly, Westbank, B.C.—Grafts of *Corylus* spp.
- Col. C. H. Grey, Hocker Edge, Cranbrook.—Seeds and plants, including *Epacris miniata*, and *Lapageria rosea* var. *superba*.
- Dr. R. Giuseppi, Felixstowe.—Plants, including *Drapetes Dieffenbachii*.
- Capt. H. G. Hawker, Strode, Ermington.—A collection of *Crocus* spp., and bulbs of *Narcissus Watieri*.
- Messrs. Hillier & Sons, Winchester.—Hardy trees and shrubs.
- Captain C. Ingram, Benenden.—Seedling Mexican oaks, and trees and shrubs.
- Messrs. George Jackman & Son, Woking.—Hardy shrubs.
- Hon. Robert James, St. Nicholas, Richmond, Yorks.—Plants of *Pelargonium salmoneum*.

- Major L. Johnston, Mentone.—Collection of half-hardy trees and shrubs.
- Knap Hill Nursery Ltd., Woking.—Plants, including trees and shrubs.
- Messrs. Laxton Bros., Bedford.—Hardy trees and shrubs.
- Mr. H. Q. Levy, Brown's Town, Jamaica.—Orchids.
- Miss N. Lindsay, Abingdon.—Collection of shrubs.
- Messrs. Stuart Low & Co., Enfield.—Grafts of *Hamamelis mollis*.
- H.M. Queen Mary, Marlborough House.—A collection of flowering trees and shrubs.
- Capt. Neil McEhearn, Pallanza.—A large collection of plants including *Fuchsia* spp.
- Lt.-Col. L. C. R. Messel, Nymans, Handcross.—Grafts of *Magnolia Dawsoniana*.
- Mr. F. W. Millard, East Grinstead.—Alpines and *Rhododendron* spp.
- Mr. C. W. Christie Miller, Henley-on-Thames.—Orchids.
- The Earl of Morley, Saltram, Devon.—Mexican oak seedlings.
- Mr. G. H. Murdock, Freemantle, Australia.—A collection of ferns and stove plants.
- Mr. H. Nalder, Cork, I.F.S.—Plants of *Kalanchoë* and *Cotyledon* spp.
- Dr. W. E. de Nol, Amsterdam.—Bulbs of *Hyacinthus* and *Muscari* spp.
- Prof. F. W. Oliver, Limsfield, Surrey.—A collection of *Stapelia* spp.
- Mr. D. J. Oman, Rustington, Sussex.—Stove plants, including *Nepenthes Henryana*.
- Mr. J. Overall, Sulphur Creek, Tasmania.—A miscellaneous collection of plants including *Erica* spp.
- Major Albert Pam, Broxbourne.—Plants, including *Glyptostrobos heterophyllus* and *Sollya Drummondii*.
- Mr. I. B. Parker, Bradford.—Economic plants.
- Mr. S. R. B. Pask, St. Paul's School, West Kensington.—A collection of insectivorous plants.
- Dr. W. Rama, Madagascar.—A collection of orchids.
- Mr. Lionel de Rothschild, Exbury.—Nymphaeas.
- Messrs. L. R. Russell Ltd., Windlesham.—*Rosa* spp. (budding material).
- Messrs. B. Ruys Ltd., Dedemsvaart, Holland.—Plants and cuttings, including *Aesculus* spp.
- Mr. F. D. Sandeman, Kingennie, Angus.—Alpines.
- Messrs. Sanders, St. Albans, Ltd.—Orchids
- Mr. G. C. Sankey, Hastings.—Pelargoniums.
- Mr. T. Sharp, Westbury.—Succulents and a collection of aquatic plants.
- Major P. Slessor, "Toc H," Poperinghe, Belgium.—A collection of New Zealand plants.

- Messrs. W. C. Slocock Ltd., Woking.—Plants, grafts and cuttings of hardy trees and shrubs.
- Major A. A. Dorrien-Smith, Tresco.—Seeds and plants, including *Kniphofia* spp., and *Puya alpestris*.
- Messrs. C. Smith & Son, Guernsey.—Plants of *Camellia* spp.
- Major F. C. Stern, Goring-by-Sea.—Miscellaneous collection of plants.
- Mr. E. Sumner, Tamworth.—Herbaceous plants and seeds.
- Messrs. Sutton & Sons Ltd., Slough.—Cuttings of *Pensilemon* spp.
- Mr. G. M. Taylor, Longniddry, East Lothian.—A collection of Liliums and Magnolias.
- Mr. A. C. Trott, Tehran.—A large collection of seeds, comprising species of *Berberis*, *Cotoneaster*, *Crataegus*, *Malus*, etc.
- Messrs. Robert Veitch & Son Ltd., Exeter.—Grafts of hardy trees and shrubs.
- Dr. R. S. Wale, Epsom.—A collection of *Sempervivum* spp.
- Messrs. R. Wallace & Co., Ltd., Tunbridge Wells.—Grafts of Rhododendrons.
- Captain G. F. Warre, Roquebrune, A.M., France.—A miscellaneous collection of plants.
- Messrs. J. Waterer, Sons & Crisp Ltd., Bagshot.—Seedling *Aesculus indica*, grafts and seeds of *Quercus Mirbeckii*.
- Mr. R. E. Weaver, St. Margarets Bay, Kent.—A collection of cuttings of stove plants.
- Mr. A. G. Weeks, Limpsfield, Surrey.—Herbaceous and alpine plants.
- Lord Wigram, Windsor Castle.—Plants of *Colletia spinosa*.

### Bedgebury Pinetum

The results of the wet summer of 1936 were very noticeable in the vigorous growth of many trees, and in the luxuriance of the ground vegetation such as bracken, grass, and heather. Many trees added at least two feet to their height and a number of those that were badly injured by the disastrous frost that occurred on the night of May 16–17, 1935, formed new leading shoots. However, the harmful results of that frost have not entirely disappeared, for some of the trees that were killed back into old wood are still very stunted, and although some may form new leading shoots from dormant buds, it is doubtful whether the most enfeebled will recover, and they may have to be replaced. Unfortunately, frost-injured plants are particularly susceptible to further injury by pests. Last spring most of the trees started into growth late, and little harm was caused by spring frosts. Early autumn frost caused some damage, especially to unripened shoots of *Cunninghamia lanceolata* and to several tsugas. In low-lying places 14° of frost were registered on the mornings of October 4th and 9th.

Naturally regenerated trees have grown very fast, and some well placed specimens have been specially labelled in order that they may be compared with planted trees in years to come. Naturally regenerated Scots pine trees are prominent throughout the Pinetum, but there are natural seedlings of many other kinds. In a small protected area the following species of trees and shrubs, all natural seedlings, may be seen growing together :—*Thuja plicata*, *Chamaecyparis Lawsoniana*, *Pseudotsuga Douglasii*, *Pinus sylvestris*, *Abies grandis*, *A. nobilis*, *Picea sitchensis*, *P. Abies*, *Tsuga heterophylla*, *Taxus baccata*, *Ilex Aquifolium*, *Betula verrucosa*, *B. pubescens*, *Quercus Robur*, *Salix* sp., *Rhododendron ponticum*, *Calluna vulgaris*, *Erica cinerea*, *E. Tetralix*, *Cytisus scoparius*. Elsewhere there are additional species. There are numerous seedlings of *Larix decidua*, only one of *Sequoia sempervirens*, but, on the forest plots, a number of *Cryptomeria japonica*.

The gradual pruning of the lower branches of some of the larger-growing species of planted trees has been in progress for four years, and useful information on the progress of healing of wounds made on young trees is now available for those who are studying the effect of pruning on young forest trees.

During May much of the water was siphoned out of Marshall's Lake and several weeks were spent in removing mud deposits. In some places the mud banks were reduced by forty feet.

Lt. Col. F. R. Durham very kindly visited the Pinetum in March for the purpose of advising on the control of flood water in some of the water courses. By following his advice less erosion appears to be taking place in the banks of the streams, and less silt is being carried into Marshall's Lake.

Through the kindness of Sir John Russell, Dr. Crowther and Dr. Richardson visited the Pinetum and investigated certain soil conditions that appear to be causing yellowing in the leaves of some of the trees.

Following the decision of the Pinetum Committee to introduce broad-leaved trees amongst the conifers in order to improve the soil conditions, presentations of maples have been made by Sir John Stirling-Maxwell and by Lord Morley.

By arrangement with Forestry Commission officials a number of specimen conifers and a few well-developed oaks growing near the Pinetum have had their trunks cleared of dead branches and they are to be left as specimen trees when other timber is cut. Some of the conifers are about 70 years old and have clear trunks of from 30 to 40 feet.

In September the Pinetum was visited by about 150 members of the Royal English Forestry Society. They were greatly impressed by the work that is being done in the Pinetum and the Forest Plots, and were enthusiastic about the natural beauty of the site.



Although 1936 appeared to be a particularly wet year, the total rainfall at Bedgebury was 34·28 in. compared with 41·03 in. in 1935. November was the wettest month with 5·20 in. and January had 5·19 in. May was the driest month with ·37 in. The three hottest days were experienced in June, the temperature reaching 83° F. in the shade on June 19th, 84° on June 20th, and 80° on June 21st. The lowest temperature on the ground was recorded on the morning of February 12th when in one low place there were 26° of frost ; on the following morning 25° were registered. On higher ground the temperature was several degrees warmer.

## The Museums

Mr. W. Dallimore, I.S.O., V.M.H., the Keeper, retired under the age-limit at the end of March. He is now living at Bidborough, near Tunbridge Wells, and is continuing to act as Honorary Curator of the National Pinetum at Bedgebury. Dr. J. Hutchinson, Botanist in the Herbarium, was appointed to succeed him, and took up his new duties on April 1st (K.B. 1936, 189).

Routine work connected with correspondence occupied a considerable amount of time as in previous years. The addition of a temporary technical assistant to the staff has been a great help in re-labelling the exhibits. The permanent staff have thus more time for scientific work, including the checking of the valuable Arboretum Herbarium with authenticated specimens.

A start has been made with the revision of genera of economic importance, the first group to be dealt with being the copal gum trees of the tropics, *Copaifera*, etc. The preservation of good herbarium specimens associated with exhibits of economic plants in the Museum cases seems desirable and a Herbarium of Economic Plants has been started ; contributions towards it will be welcomed.

A considerable number of enquiries are received regarding the cause of death of stock, impurities in grain samples, etc., necessitating the identification of seeds, and a small seed collection is being formed to facilitate this work.

Dr. Howes has continued his work on vegetable waxes, and a paper on the subject has been published (K.B. 1936, 503).

Dr. Melville has checked the names of the elms and willows in the living collections, and has named a large number of conifers and other trees sent by correspondents.

Apart from administrative work and new exhibits, the Keeper has been occupied with finishing the work in hand at the time of his transference from the Herbarium staff. This included the determination of Mr. J. Gillett's Somaliland and Abyssinian collection and of his own South African and Rhodesian plants. He has also been responsible for seeing through the press the text of " The Useful Plants of West Africa " which will be published early in 1937.

An important function of the Museums is the dissemination of information with regard to crops, economic and poisonous plants, etc., and the card catalogue of current literature, which was commenced a few years ago, is being enlarged to include earlier references. When finished this should be a valuable repository of information, including a list of common and native names.

Assistants in the Department have continued to serve on the Crude Drugs Sub-Committee of the British Pharmacopoeia Commission and on the Empire Minor Forest Products Committee of the Imperial Economic Committee, the body responsible for the recently published "Index of the Minor Forest Products of the British Empire." Assistance has also been given by members of the department in drawing up lists of names of well-known economic plants for conservation.

In Museum 2 a commencement has been made in re-labelling the specimens on the top floor. For large exhibits, cream-coloured, stencilled cards have been prepared.

The cases in the west end of the Annexe of Museum 3 had become badly decayed and have been replaced by larger cases giving much-needed space. As this is the best lighted of the Museums, some new exhibits of general interest have been added, including a fine set of veneers used in decorative work, many of them having been employed in the liner "Queen Mary." These have been presented by Messrs. John Wright (Veneers) Ltd. Two large glass cases have been filled with Dr. I. B. Pole-Evans' photographs of South African vegetation, together with maps and descriptive text of the floral regions. In connexion with this exhibit specimens of everlasting flowers from South Africa have been placed on tables nearby. Into other window-bays where they can be shown to better advantage exhibits of special interest have been moved from the cases in Museum 1. The facade of the large Indian case at the west end of the main building has been temporarily used for a display of pictures of Swiss Alpine plants.

In Museum 4 the specimens on the top floor have been re-labelled and an up-to-date exhibit of the manufacture of tennis rackets from laminated woods has been arranged.

The chief visiting workers during the year were: Dr. Tj. J. Addens (Holland), studying the opium poppy; Mr. G. Komitzer (Palestine), pasture plants; Mr. J. H. Holland (England), overseas plant products; Mr. W. J. Renauf (Guernsey), subtropical fruits.

Presentations to Museums.—Messrs. F. H. Ayres, Ltd.; London; examples of the manufacture of tennis rackets.

Mr. P. Bowden, Kew; toy made from seed of *Entada gigas*.

Messrs. Cadbury Brothers, Ltd., Bournville; brazil nuts.

Mr. E. W. Carls, California; specimens of woods.

Messrs. Chivers and Sons, Ltd., Histon, Cambridge; bottled fruits.

Mr. A. D. Cotton, O.B.E., Kew ; native mat of palm leaves from Nigeria.

Mr. W. S. Dahl, London ; powders used for plastics.

Mr. M. T. Dawe, O.B.E., Palestine ; Album of Jaffa Orange Syndicate, Ltd.

Dr. H. E. Durham, Cambridge ; pieces of mistletoe wood.

Mr. R. E. P. Dwyer, New Guinea ; fruits of *Parinari laurina* ; fibres.

Dr. H. G. Fourcade, Witte Els Bosch, S. Africa ; everlasting flowers.

Mr. J. L. Froggatt, New Guinea ; specimens of timbers.

Mr. C. W. Hiscocks, Holborn ; Tonkin cane as prepared for golf shafts.

Dr. F. N. Howes, Kew ; seeds of sweet corn.

Miss M. W. Hughes, London ; specimen of wood excavated from Roman road.

Prof. Jaccard, Zurich ; timber specimens.

Mr. A. Bruce Jackson, Kew ; photographs and herbarium specimens.

Dr. J. Muir, Riversdale, South Africa ; drift seeds and everlasting flowers.

Mr. J. B. Paterson, New Zealand ; fruits of " Waratah " (*Telopea speciosissima*).

Mr. G. A. Peacock, Bath ; timber specimens.

Sir Albert Seward, F.R.S. ; section of wood of *Sophora japonica*.

Mr. H. M. Sharpington, West Norwood ; Venesta plywood veneers.

Mr. J. H. Turner, Kew ; " Cellotex " insulating board.

Lady Wakehurst, Ardingly ; fruits and lantern slides.

Messrs. John Wright and Sons (Veneers) Ltd., London ; 62 samples of veneers.

Duplicate Museum specimens have been distributed to Prof. Holden, Nottingham (specimens of fibres) ; Dr. J. Muir, Riversdale, South Africa (seeds of *Leguminosae*) ; M. Zammit, Malta (samples of woods) ; Mr. A. L. Thorpe, Derby (samples of tea plant) ; Mr. G. A. Peacock, Bath (samples of woods).

## The Jodrell Laboratory

The range of enquiries dealt with and the nature of the material submitted for identification by microscopical means has been as varied as usual. Much of the material consisted of timbers, barks, roots and fibres. The more unusual items included the wood of *Liriodendron tulipifera* (tulip tree) painted black, masquerading as ebony in " antique " furniture ; pith imported from China which proved to be that of a species of *Juncus* ; material clogging up water mains consisting of elm roots ; the contents of the crop of a pigeon which were the underground portions of wood anemones (*Anemone*

*nemorosa*) ; and a " weed " in samples of flax, identified as two species of *Juncus*. Botanical material excavated in Palestine was also identified. Enquiries concerning the storage of seeds and bulbs during transport, the chemical composition of ivy leaves, the growth of roses and carnations in water containing mineral salts, the development of *Opuntia* embryos, and the change in colour of insects caused by the presence of manganese on the plants on which they feed, were also dealt with. All identification work has been greatly facilitated by the reference collection of microscopical preparations which now consists of over 4000 slides.

The researches on the effect of atmospheric pollution, especially on greenhouse plants, have been continued. This work is being carried out in collaboration with H.M. Office of Works, the Government Laboratory, and the General Electric Company, whilst Professor V. H. Blackman, F.R.S., and others interested in the subject have been consulted from time to time. An exhibit showing some of the effects of atmospheric pollution of plants was staged at the Science Museum, South Kensington, during the special exhibition arranged by the National Smoke Abatement Society in October. During the conference of this society, which was held at the same time, a paper was read by the Director giving an account of the work on atmospheric pollution in progress at Kew. So far as greenhouse plants are concerned it has been established that the principal cause of the damage which occurs during foggy weather is the action of the sulphur acids in the atmosphere, which are especially deadly in their effect under suitable conditions of moisture and temperature. Experiments with artificial light to supplement daylight during the winter months are also in progress, but are not yet sufficiently advanced for any conclusions to be drawn.

The work on the morphology and life history of different races of *Ranunculus Ficaria* has been continued, and many interesting points have been discovered. It is hoped that an account of this work will shortly be ready for publication.

Mr. J. Pryde continued his work on the nature of the chemical substances present in a number of different kinds of wood from South Africa. Other visitors to the laboratory included Mr. R. A. Blake-lock (rhizomes), Mr. D. P. Watson (structure and germination of Leguminous seeds), Mr. S. Ramanujam (cytology of rice and related plants), Mr. A. H. Nasr (algae), Mr. J. Bausch (general) and Miss W. M. Curtis (morphology and anatomy of *Taraxacum*).

**DRAWING AND PHOTOGRAPHY.**—A number of type specimens, both Kew sheets and those borrowed from other Herbaria, have been photographed. A certain number of living plants have been photographed or drawn for the Gardens Collection.

A few drawings have been made for " Hooker's *Icones Plantarum*." Drawings, maps and photographs have also been prepared for inclusion in the new Guide to the Gardens, the Kew Bulletin, and

for Mr. J. D. Snowden's work on sorghums. Enlargements from small photographs made by Dr. Pole-Evans in South Africa, were made for use in the Museums.

In connection with the work at the Potterne Biological Station photographs and drawings, some in colour, have been made of *Silene*, *Anagallis*, *Epilobium* and *Centaurea*, and drawings and diagrams in collaboration with Dr. Metcalfe have also been made of the bulbils of *Ranunculus Ficaria*. In many specimens the structure was so complex that it was necessary to construct plasticine models from the serial sections before making the diagrams.

Assistance was given to Mr. A. Farghaly, Faculty of Agriculture, Giza, Egypt, in illustrating a paper on the anatomy of *Zilla spinosa* which he was preparing for publication. Visitors who have worked in the Studio or who have received some assistance included: Mrs. M. E. Wilson (London), Mrs. H. N. Moldenke (New York), Mr. C. G. Trapnell (Northern Rhodesia) and Dr. G. A. C. Herklots (Hong Kong).

### The Marianne North Gallery

During the past year all the pictures painted by Miss Marianne North in many parts of the world have been rebacked with sheets of 3-ply wood. The back boards have been hermetically sealed in and the whole painted over to prevent ingress of dust and acid fumes from the atmosphere. The glass has been carefully cleaned and the pictures now appear as bright and fresh as when first painted.

When the pictures were framed and hung by Miss North they were not covered with glass and for eleven years they remained fully exposed to atmospheric conditions. Moreover, there was no wooden panelling at the back to protect them from dampness.

During the winter 1893-94, under the advice of Sir Frederick Leighton, then President of the Royal Academy, the walls of the gallery were lined with matchboard, and the pictures were varnished and backed by two or three pieces of closely fitting pine-boards and papered over, (see K.B. 1894, 165). Last year as some of the pictures appeared rather dull, the President of the Royal Academy very kindly visited the Gallery. It was then found that the acids in the atmosphere had penetrated through the paper covering the joints between the pine and wood boards and had made yellow bands on the backs of the cardboards on which the pictures are painted. This yellowing, though at the moment not a serious injury, might easily have become so. The President therefore recommended that the pictures should each be backed with a continuous sheet of plywood completely filling the back of the picture frame to prevent any ingress of air in the future. The cardboards of each picture have been treated with a solution of formalin and carefully sealed into their frames. The work was

entrusted to Messrs. James Bourlet and Sons, Ltd., of Mortimer Street, W.1. It has been carried out most efficiently and it is hoped that this valuable collection is now safe from any injury for all time.

As all the pictures had to be taken down from the walls, the opportunity has been taken to clean and restore thoroughly Miss North's decorations of the walls and upper gallery, and her panel paintings on the doors and the walls of the upper gallery. The ceiling has also been colour-washed in harmony with the wall decoration. The pitch-pine panelling of the interior of the Porch has been painted cream-colour, which makes the entrance to the Gallery far more attractive, and the doors have been repainted in colours in harmony with the Gallery decorations instead of the dull blackish-grey colour formerly employed. The electric lighting has also been modernized.

### The Herbarium

#### EUROPE, NORTH AFRICA, AND THE ORIENT.

15,880 numbers have been received for incorporation in this department of the Herbarium. This figure includes 8802 numbers received for identification or verification, but does not include single specimens or small parcels sent for determination. 11,201 sheets have been mounted and laid in.

Additions to the collections from the British Isles have been made by members of the Kew staff from Cornwall, Devon, Dorset, Norfolk, Suffolk, Lancashire, and the Irish Free State. Miscellaneous British collections were received from: Mr. G. H. Allison, Dr. N. L. Bor, the Botanical Society and Exchange Club of the British Isles, Mrs. V. Dickson, Miss M. E. Edmonds, Mr. P. M. Hall, Prof. J. W. Heslop-Harrison, Mr. H. B. Johnston, Miss M. D. Ker, Rev. F. H. W. Kerr, Mr. J. E. Lousley, Mr. F. K. Makins, Mr. G. E. Martindale, Mrs. L. Matthews, Mr. H. S. Redgrove, Mr. H. N. Ridley, Mrs. C. I. Sandwith, Mr. J. Sinclair, Mr. H. S. Thompson, Mr. C. H. Wright, and Mr. J. W. Wyatt.

Twenty specimens of *Taraxaca* from Ireland and Wales were presented by the Botanical Museum, Lund, and included newly described apomicts. Miss Thurston presented 388 specimens and three manuscript books, catalogues, and notes of Cornish plants, inherited from her brother, the late Mr. Edgar Thurston (see Kew Bull. 1935, 594).

Mr. E. Nelmes has rearranged the entire collection of *Carex* according to Kükenthal's Monograph, and has also prepared a typed Index of the genus which contains 4,000 accepted names and synonyms. In addition, he presented to Kew over 500 specimens of British *Carices* collected by him during 1936. These have been exchanged with institutions specially interested in the *Cyperaceae*,

chiefly the Botaniska Museum, Uppsala ; the Botanical Institute, Academy of Sciences, Leningrad ; and the Botanical Institute, Hokkaidô Imperial University, Sapporo, Japan.

Important collections of plants (totalling over 1,570 numbers) from the Balkan Peninsula have been received during 1936. These include Greece (the late Mr. S. C. Atchley, see Kew Bull. 1936, 336) ; Albania (Dr. F. Lemperg and Mrs. R. V. Pennington) ; N. Macedonia (Dr. P. L. Giuseppi) ; Thrace (Mr. H. G. Tedd) ; Bosnia and Hercegovina (Dr. K. Maly, Landesmuseum, Sarajevo) ; and S. Croatia (Rev. and Mrs. H. P. Thompson). A collection of Serbian plants was purchased from Dr. F. Lemperg, and plants of Thessaly, Athos Peninsula, and N. Macedonia from Mr. O. S. Grebenchikoff.

Collections from the Iberian Peninsula and Balearic Islands have been received from the Museum and Botanic Garden, Geneva ; Mrs. E. W. Moore Kennedy ; Mr. G. E. Martindale ; Mr. H. Phillips ; and Dr. R. Seligman ; and cent. 2 and 3 of *Flora Iberica Selecta* have been purchased from Dr. P. Font Quer.

Central and N. European plants have been contributed by Miss C. A. Cooper ; Mr. D. Fanshawe ; Mr. E. Hodgkin ; Mr. J. W. Wyatt ; Dr. F. J. Widder (Austria) ; Cluj University (*Flora Romaniae Exsiccata*, cent. 12-14) ; Masaryk University (*Flora Exsiccata Reipublicae Bohemicae Slovenicae*, cent. 11) ; Miss Ann Conolly (French plants) ; and Messrs. J. E. Lousley and F. Rilstone (miscellaneous European plants). *Plantae Poloniae Exsiccatae* cent. 2 was purchased from the Botanic Gardens, Cracow.

A valuable collection of Dutch plants was received from the Rijks Herbarium, Leiden. These will help to fill a considerable gap in the representation of European plants in the Herbarium. Bds. 1-6 of the "Most important agricultural cultivated plants with their weed seeds" was purchased from the Hamburgisches Staatsinstitut für angewandte Botanik.

Oriental plants were received from the Botanic Garden and Museum, Berlin (*Manisadjan, Plantae Orientales and Reliquiae Manisadjanae*) ; Rev. H. E. J. Biggs, Miss E. Daly and Mr. A. C. Trott (plants of Iran) ; Field Museum, Chicago (plants of Iran and Iraq) ; Miss L. Trotter (Persian plants) ; Mrs. V. Dickson (Arabian plants) ; Mr. J. Fernandez (plants of Bahrein Islands) ; Major W. R. Hay (plants of Afghanistan) ; Dr. A. Eig and Mr. H. B. Johnston (plants of Palestine) ; U.S.S.R. Academy of Sciences, Baku (*Transcaucasian plants*). Valuable collections from Cyprus (made by Mr. A. Syngrossides) were received from the Department of Agriculture, Cyprus, and also from Mrs. M. E. Dray.

A large collection of specimens from Antalya, Turkey, was purchased from Dr. T. A. Tengwall, and Plants of the Petra District and Hauran from Mr. J. Dinsmore.

A collection of about 100 specimens from the country behind Aden was received from Mr. R. C. Maxwell Darling, and contained

several little-known species. Collections made by Mr. E. K. Balls and Mr. A. W. Trethewy in Morocco and by Mr. C. H. Wyatt in Tunisia, which have been presented during the year, have added to our still very incomplete representation of the North African flora. The purchase of series 2-5 of *Exsiccata des Plantes Endémiques et Rarissimes du Maroc* from Mr. J. Gattefosse has been a further help in this direction.

Miss D. A. Chaytor kindly gave her services for a part of the year. She assisted in general routine work and continued her studies on the cultivated lavenders.

Mr. R. A. Blakelock has rendered valuable voluntary assistance during the year in general herbarium routine and in re-arranging the genus *Cytisus*. Mr. D. P. Fanshawe has given great help for two months in naming Central European and other collections.

Miss W. M. Curtis is continuing her research on the anatomy and development of British and other *Taraxaca*, utilizing the material being grown in the Herbarium Experimental Ground.

*Publications*.—Additions to the Flora of Cyprus: II (K.B. 1936, 16).

The Flora of the Pyrénées Orientales. New varieties and additions (K.B. 1936, 95).

On the Flora of the Nearer East: XVII (K.B. 1936, 100).

The History of *Rheum Rhaponticum* L. (Bull. Soc. Bot. Bulg. 7, 23: 1936).

Notes on the Genus *Sempervivum* (Bull. Soc. Bot. Bulg. 7, 124: 1936).

## ASIA.

INDO-MALAYA.—The "Flora of the Presidency of Madras" was completed by the publication early in February of Part 11, consisting mainly of the addenda, corrections and general index. A considerable number of sheets, partly current receipts and partly accumulated arrears, have been mounted and laid in during the year. A large quantity of accumulated material still remains to be dealt with.

Professor E. Barnes continued his investigations into the flora of S. India and again sent useful notes and valuable specimens to the Herbarium. Several of the plants have been found to be novelties.

The collection made in Tibet and Sikkim by Messrs. C. S. Cutting and A. S. Vernay, referred to in last year's report, was worked through. It proved of unusual interest, since it included 9 new species; an account will be published shortly in the Bulletin. The examination of the collections made by Capt. F. Kingdon Ward in Assam in 1928 and by Mrs. N. E. Parry in the Garo Hills in 1928-1930 was completed. The former contained several new species.



Dr. N. L. Bor of the Indian Forest Service spent several months at Kew working on the grasses which form part of a large collection made by himself in Assam, mainly in the Naga Hills. Work on the collection is being continued by the Botanist for India and it will certainly add greatly to our knowledge of the flora of that region. Mr. H. K. Nandi presented a number of specimens found by himself in Assam, principally in the Khasia Hills. This collection is being dealt with in conjunction with that of Dr. Bor. Smaller collections were received from the Rev. W. J. L. Wenger from the Chittagong Hill tracts, from Mr. R. N. Parker, collected in the Punjab, and from the Forest Research Institute, Dehra Dun.

Dr. A. F. G. Kerr and Mr. H. B. Garrett contributed interesting plants from Siam. The Singapore Botanic Gardens again presented a considerable number of named sheets and valuable material was also supplied by the Malay States Forest Research Institute, Kepong.

The Forest Department, British North Borneo, continued to send collections; the identification of the material received up to the end of 1935 has been continued to the end of the *Polypetalae*. The naming of the collection made by the Oxford University Expedition to Sarawak in 1932 is now almost complete, and it is hoped that outstanding novelties will be described and the duplicates distributed within the next six months.

About 400 named duplicates, including 150 specimens of cultivated palms, were presented by the Botanic Gardens, Buitenzorg, and 440 by the Bureau of Science, Manila. 120 specimens of Celebes plants were received from the Botanic Garden and Museum, Berlin, and a similar number from the National Museum of Natural History, Paris.

Miss M. M. Whiting once more gave voluntary service in sorting and re-arranging the collections in the Indo-Malayan region, particularly in separating the different sections, in establishing the type specimens and in naming material according to recent revisions.

*Publications*.—Contributions to the Flora of Borneo and other Malay Islands: V (K.B. 1936, 17).

Contributions to the Flora of Siam: XL (K.B. 1936, 34).

The anatomy of some Lauraceous scent-yielding woods known as "Medang", by B. Alwyn Jay (K.B. 1936, 66).

New or little-known plants from S. India: VII (K.B. 1936, 274).

Plants new to Assam: VIII (K.B. 1936, 280).

A Note on the Himalayan *Daphnes* (K.B. 1936, 433).

Notes on the Genus *Schima* and on the Classification of the Theaceae-Camellioidae (K.B. 1936, 496).

CHINA, JAPAN AND NORTHERN AND CENTRAL ASIA.—The most important collections received during the year were two sets of specimens from the Island of Hainan. One, of 1008 specimens, was collected on the 4th Hainan Expedition of the New York Botanical Garden, and was presented by that Institution; the

other consisted of 930 specimens collected on the 6th Hainan Expedition, presented by the Bentham-Moxon Trustees. These, together with the extensive collections from the island received from former expeditions (the 2nd and 3rd sent out by the New York Botanical Garden) will render the flora of that island better represented at Kew than that of almost any other part of South China.

The following specimens were also presented:—A set of named Chinese rhododendrons by Lord Aberconway; a collection of Yunnan plants by Mrs. A. Grist; flowering plants and *Carices* of Central Asia by the U.S.S.R. Academy of Sciences, Leningrad; and specimens of *Eremurus* by Dr. A. Vvedensky.

*Research*.—A revision of the Chinese species of *Gentiana*, comprising an enumeration and key of 184 species with numerous varieties, is now in proof, together with two other papers on the genus, *viz.* "New Chinese species of *Gentiana*" described by Dr. H. Smith, and "Contributions to the Gentian Flora of Southern Tibet, N.E. Burma and Bhutan", including the descriptions of a number of new species.

#### AFRICA.

Owing to Dr. J. Hutchinson's appointment to the Keepership of the Museums only one Botanist and two Assistant Botanists have been working on Tropical African plants during the greater part of the year. The work of naming incoming collections has occupied the greater part of official time, but the maintenance of the herbarium and the writing-up of genera by recent revisions has not been neglected. The African species of the genera *Achyrosperrum* Blume (*Labiales*), *Pseuderanthemum* Radlk. and *Ruspolia* Lindau (*Acanthaceae*) were revised, several miscellaneous new species were described and notes as to little-known or misunderstood species were published. Work on the genus *Ammocharis* Herb. (*Amaryllidaceae*) in collaboration with Dr. H. G. Schweickerdt has continued.

WEST TROPICAL AFRICA.—With the "Flora of West Tropical Africa" now completed it is possible to see how imperfect is still the state of our knowledge of the flowering plants of certain parts of the Territory. Collections received during the year from the Gold Coast and from Nigeria contain species, not only new to the West African floristic area, but new to science. Well-preserved collections with accurate observations will be welcomed from the interior of any of the West African Colonies. In particular specimens of succulent plants such as *Aloë* and certain *Euphorbia* species, and members of the *Asclepiadaceae* are required. Information as to the best method of preserving these plants will be given on request.

Dr. A. Chevalier has presented a valuable set of named duplicates of specimens collected by him in Cape Verde Islands. Mr.

F. C. Deighton has continued to send specimens, accompanied by most useful notes, of Sierra Leone plants, about 200 having been received through the Department of Agriculture. Dr. F. R. Irvine presented a further 250 specimens from the Gold Coast and nearly 100 specimens were received from the Gold Coast Forestry Department, mainly collected by Mr. C. Vigne and Mr. J. E. Andoh. Mr. C. S. Cansdale presented a small collection, mainly of terrestrial orchids, from the Northern Territories, which proved to be of special interest. A few Nigerian specimens were received from Mr. I. D. Hepburn, and about 130 from Mr. R. J. Newberry. The Imperial Forestry Institute contributed some named duplicates from Nigeria and from the Gold Coast.

CAMEROONS AND CONGO.—About 900 named specimens were received in exchange from the Botanic Garden, Brussels. These are mainly plants collected by Dr. W. Robyns in the Belgian Congo, and form a valuable addition to our Congo collections which are still very weak. The Gray Herbarium also forwarded some specimens from the Belgian Congo.

NORTH-EAST TROPICAL AFRICA.—Two valuable collections were received from the Department of Agriculture, Uganda, collected on the Imatong Mountains in the southern Anglo-Egyptian Sudan (360 specimens collected by Mr. A. S. Thomas, and over 100 by Mr. H. B. Johnston). They should add very considerably to our knowledge of the flora of these mountains, which form such an important link in the chain of distribution of the montane flora of Tropical Africa. Major G. Aylmer presented about 300 named specimens, mainly from the forests of the southern Sudan. Mr. F. W. Andrews contributed a further collection of about 100 specimens, including a number of water-plants preserved in spirit, from the Blue Nile Province. Some of these were species not previously recorded from the territory. Collections of a similar nature from this and other territories would add greatly to our knowledge of this neglected group of plants. The determination of Mr. J. B. Gillett's Somaliland collection is now practically completed.

EAST TROPICAL AFRICA.—Some exceptionally fine collections have been received from this area during the year. Although the proposed "Flora of British East Africa" still awaits official sanction, it is important to acquire good collections from East Africa in advance, and help in this direction from any interested persons willing to collect will be welcome.

UGANDA.—A collection of over 600 specimens was purchased from Mr. W. J. Eggeling, who made a private expedition through the little-known north-eastern parts of the Protectorate. This has added many new records to the Uganda flora, and has em-

phasized the need for collections from the more remote parts of East Africa. In the genus *Acacia*, to take one example, Mr. Eggeling made 14 gatherings, representing 9 species. Of these, two are unrecognized and are probably undescribed species, five are species previously unrecorded from the Protectorate, one was known only from the north-west corner of Uganda, and the remaining species had been recorded only once before. Mr. Eggeling has, in addition, forwarded to Kew, either personally or through the Forestry Department, over 300 specimens, including a number of interesting orchids, and 20 other specimens collected by Mr. R. G. Sangster were received from the Conservator of Forests. Mr. H. B. Johnston presented over 100 specimens from Uganda and the adjacent parts of the Belgian Congo. Thanks are also due to the Officers of the Uganda Department of Agriculture who collect with skill and continue to show much enthusiasm, fine consignments having been received from that Department collected by Messrs. P. Chandler, G. L. R. Hancock, A. S. Thomas, and C. Hazel, amounting to several hundred numbers. A large collection was also received from Mr. A. P. G. Michelmores, and Miss D. C. Mainwaring presented a small but interesting collection of Uganda and Kenya plants. There is still much collecting to be done in Uganda, and certain groups, such as succulents and water-plants, are badly represented.

*Kenya*.—Over 100 specimens were received from the Forestry Department, including collections from the coastal forests and from the Cherangani Mountains, whilst the Department of Agriculture sent a similar number for identification. Collections from the dry northern parts of the Colony were received from Messrs. A. M. Champion, C. Maher and H. B. Johnston, who also made a small collection in the adjacent territory of Italian Somaliland. We greatly miss the receipt of the good collections from the Coryndon Memorial Museum at Nairobi, which have been sent to Kew during past years.

*Tanganyika*.—Mr. B. D. Burtt of the Department of Tsetse Research has sent about 700 very fine specimens collected in various parts of the Territory. Their value is greatly increased by the ample material provided, thus making it possible to distribute duplicates of rare or little-known plants to African and continental herbaria. Messrs. C. H. N. Jackson and H. M. Lloyd of the Department of Tsetse Research also forwarded small but interesting collections through Mr. Burtt. From the Department of Agriculture nearly 400 specimens were received, collected by Mr. H. Gillman in the Bukoba District and by Mr. N. V. Rounce. Mr. P. J. Greenway, Botanist at the East African Agricultural Research Station, Amani, sent for identification over 900 specimens, more than 400 of which were collected by himself. An interesting collection, mainly from the little-known Ufipa District, was received from Mr. A. P. G. Michelmores. Other collections were received from Mrs. G. A.

Chambers, Dr. and Mrs. A. T. Culwick, and Mr. R. G. Turrall. About 70 named duplicates were presented by the Imperial Forestry Institute.

From Zanzibar a few orchids were received from Mrs. T. C. Vaughan, and some named specimens from the Imperial Forestry Institute.

**SOUTH TROPICAL AFRICA.**—Comparatively little came from this area during the year. Sr. A. de F. Gomes e Sousa has presented about 220 very acceptable specimens from the neighbourhood of Inhambane, Portuguese East Africa ; Mr. F. Eyles has sent a further 170 specimens from Southern Rhodesia. Duplicates of Nyasaland plants were presented by the Imperial Forestry Institute, and the Nyasaland Department of Agriculture sent about 40 specimens, including rices and grasses, for naming. Two small collections came from Northern Rhodesia ; about 30 specimens from Captain K. R. Paterson collected on his farm in the Mwinilunga District, and 100 specimens from Fort Jameson collected by Mrs. M. G. Winterbottom.

#### SOUTH AFRICA.

Revisions of the South African material of the genera *Tribulus* L., *Brachylaena* R. Br. (by Dr. H. G. Schweickerdt in collaboration with Dr. E. P. Phillips, Pretoria) and *Helictotrichon* Bess. ex Schultes have been completed, and the MS. has been despatched to Pretoria for publication. In addition Dr. Schweickerdt has continued his researches on South African *Gramineae* (see p. 568), and, in collaboration with Mr. E. Milne-Redhead, on the genus *Ammocharis* Herb. An account of " Newly Recorded Genera of South African Plants " has been completed and is due to appear in the next volume of the " South African Journal of Science."

Miss H. Forbes (see p. 533) of the Natal Herbarium, Durban, the second Assistant seconded for duty at Kew from South Africa, arrived at Kew towards the end of June and is undertaking a revision of the South African species of *Tephrosia* Pers.

During the course of the year 1153 specimens from South Africa were named, and 3904 specimens were incorporated in the herbarium.

A fine collection made by Dr. K. Dinter in South-West Africa, consisting of nearly 1000 numbers, was purchased. About 60 specimens were received for identification from the McGregor Museum, Kimberley, and a small collection of *Aristida* and *Tephrosia* from the Orange Free State University College, Bloemfontein, whilst some 200 named duplicates were received from the Natal Herbarium and a few from the Transvaal Museum. As usual, the National Herbarium, Pretoria, contributed a large number of specimens, partly named, partly for identification, over 1200 being

received during the year. Of these a set of 50 *Aloë* species collected by Mr. G. W. Reynolds is of special interest. Prof. R. S. Adamson, Dr. H. G. Fourcade, Mr. N. S. Pillans and Captain T. M. Salter presented fine named collections of Cape plants, whilst Mr. F. R. Long of Port Elizabeth forwarded 100 specimens for identification. From the Botanic Garden and Museum, Berlin, 30 specimens of Schlechter's South African *Asclepiadaceae* were received.

The investigation of the genus *Scabiosa* in tropical and southern Africa has been continued by Mr. B. L. Burtt and the Director, with the aid of specimens sent on loan by various institutions. The work is now nearing completion and it is hoped to publish a paper embodying the results during the coming year.

*Publications*.—*Achyrosperrum* in Tropical Africa (K.B. 1936, 47).

New and Noteworthy South African Plants : VIII, by J. Burtt Davy and J. Hutchinson (K.B. 1936, 80).

*Mundulea* Fish Poison, by P. J. Greenway (K.B. 1936, 245).

*Eranthemum* of the "Flora of Tropical Africa" (K.B. 1936, 255).

The Cultivation of *Hydnocarpus Wightianus* in Nigeria, by J. D. Kennedy (K.B. 1936, 341).

Tropical African Plants : XIV (K.B. 1936, 469).

The Flora of West Tropical Africa, vol. 2, pt. 2.

## AMERICA.

During 1936, about 9700 sheets have been mounted and 5500 have been incorporated, a satisfactory increase on the numbers of the previous year. Two collections from British Guiana were dealt with, one made by the Forest Department on the Upper Demerara River, and the other by the entomologist Mr. J. G. Myers in the far interior of the Colony ; both were of great interest and contained material of trees new to science. In addition, a third consignment was received from the Department of Agriculture for naming, consisting mainly of old specimens from the Jenman Herbarium, Georgetown. A portion of typescript for the "Flora of Trinidad and Tobago," completing the account of the *Calyciflorae*, was carefully examined, and was later discussed with Prof. E. E. Cheesman, who, with Mr. Nigel Wright, Lecturer in Botany at the Imperial College of Tropical Agriculture, is continuing the preparation of the Flora in co-operation with Kew. A valuable acquisition from Trinidad was the purchase from his executors of the personal collections, botanical registers, and other papers of the late Mr. W. E. Broadway. The collections amount to nearly 1000 numbers

which have been checked and incorporated, or distributed as duplicates, with the help of Mr. R. E. Dean, now Curator of the Royal Botanic Garden, Trinidad.

Mr. G. B. Hinton has continued to send remarkably fine series of specimens from Central Mexico, and a member of the staff is permanently occupied in dealing with these collections, which have now reached nearly 10,000 numbers.

A considerable amount of time has been spent in the preparation of an account of the *Bignoniaceae* of Surinam for Dr. A. Pulle's Flora of that Colony. Other special investigations were a thorough study of the Mexican species of *Bursera*, which was undertaken for the purpose of naming Mr. Hinton's extensive material; and the examination of 87 gatherings of tropical American *Strychnos* received from the New York Botanical Garden. A few large genera were re-arranged, notably *Cayaponia*, *Forsteronia*, *Odontadenia* and *Mandevilla*.

Among other collections determined during the year were three from North America, received during 1935, made by Miss M. M. Whiting (Canada), Rev. and Mrs. H. A. Turner (Baffin Land) and Mr. C. W. Thornton (Alaska); a collection from Bolivia, made by Mr. G. E. Wolstenholme; and an interesting set of Argentine plants sent by Dr. A. Burkart, during 1936, was also named.

The following collections were also received:—

N. AMERICA.—*Presented*: By the National Herbarium of Canada, Ottawa (a large number of specimens, mainly from the eastern arctic regions); University of Florida Agricultural Experimental Station (further specimens of *Zephyranthes*); Imperial Forestry Institute, Oxford (North American Asters); by the University of California, Berkeley (Californian plants); Gray Herbarium (*Plantae Exsiccatae Grayanae*, cent. 6, and plants of Virginia); Dr. F. A. Rodway, Nowra, New South Wales (Californian plants, coll. L. S. Rose); Stanford University (plants of California and Oregon); U.S. National Museum, Washington (plants of United States and Florida).

CENTRAL AMERICA.—*Presented*: By the U.S. National Museum, Washington (collection of flowering plants and ferns from Oaxaca, Mexico, and other Central American plants). *Purchased*: Mr. H. Scott Gentry (the Rio Mayo District of Mexico); Mr. C. L. Lundell and Mr. W. A. Schipp (British Honduras); Dr. A. F. Skutch (Costa Rica).

WEST INDIES.—*Presented*: By the Empire Cotton Growing Corporation (interspecific hybrids of *Gossypium*); Gray Herbarium (Cuba). *Purchased*: Rijks Museum, Stockholm (Haiti and San Domingo, coll. Dr. E. L. Ekman).

**EAST TROPICAL S. AMERICA.**—*Presented* : By the Rijks Museum, Stockholm (Brazil, coll. P. Dusén) ; U.S. National Museum, Washington (miscellaneous specimens) ; Botanical Museum, Utrecht (Surinam).

**WEST TROPICAL S. AMERICA.**—*Presented* : By the University of California (Peru, coll. Mrs. Ynes Mexia) and U.S. National Museum, Washington (Peru and Ecuador). *Purchased* : University of California (Brazil and Peru, coll. Mrs. Ynes Mexia) ; U.S. National Museum, Washington (Peru, coll. Mr. G. Klug).

**TEMPERATE S. AMERICA.**—*Presented* : By Dr. F. Felippone (Uruguay) ; Museum and Botanic Gardens, Geneva (miscellaneous American plants).

*Publications.*—Contributions to the Flora of Tropical America : XXV–XXVIII—Species novae vel minus cognitae mexicanae Hintonianae (K.B. 1936, 1 and 387).

Notes on the Mexican species of the genus *Bursera* (K.B. 1936, 346).

The genus *Tovomitia* in British Guiana (K.B. 1936, 210).

Notes on an Expedition to the Rupununi District, British Guiana, by T. A. W. Davis (K.B. 1936, 526).

#### AUSTRALIA AND NEW GUINEA.

Much time has been spent in replying to queries and in naming small collections, but good progress has been made in the determination of Mr. C. E. Hubbard's large Queensland collection, and thanks to the voluntary assistance again kindly given by Miss M. D. Ker it has been possible to make a further distribution of duplicates. In the early part of the year Dr. W. E. Blackall continued his work on his Western Australian plants. Valuable collections were received from Mr. J. M. Black (Adelaide), Mr. C. T. White (Brisbane Botanical Museum), Dr. F. A. Rodway (New South Wales), the National Herbarium, Sydney, and the Department of Agriculture, Western Australia. Collections were also received for naming from Mr. E. Ashby (S. Australia) and from the North Queensland Naturalists Club.

Continued consignments of Papuan plants presented by the Bentham-Moxon Trustees, were received from Mr. C. E. Carr until his death in the summer ; these numbered over 3000 gatherings during the current year.

Good progress is being made in the mounting of Australian plants in the stores and it is hoped that the greater part of these will be incorporated in the Herbarium during the coming year.



## NEW ZEALAND.

Only routine questions and small collections have been dealt with. A number of selected specimens of newly described or rare species have been received from Dr. H. H. Allan, which are valuable additions to the collections.

## OCEANIA.

Several small collections from various island groups have been named, including one of Gilbert Island plants from Mr. H. E. Maude; further specimens will be welcome from this region. Collections have been received from the following:—Bernice P. Bishop Museum, Hawaii, and Field Museum, Chicago (Hawaiian Plants); Kyushu Imperial University, Japan (Plants from Micronesian Islands) and the New York Botanical Garden (Fiji plants collected by Dr. A. C. Smith). A small collection of Bougainville Island plants was purchased from the Rev. A. H. Voyce.

*Research.*—Work on the specimens of *Ficus* collected in Fiji by Dr. A. C. Smith was completed and the manuscript has been sent to Dr. Smith for inclusion in the general account of his Fiji plants. Figs from many other groups have also been studied and it is hoped to prepare accounts of several other collections for publication shortly.

*Publications.*—Melanesian Plants: II (K.B. 1936, 459).

On the Systematic Position of the Genus *Dolianthus* C. H. Wright, by C. E. B. Bremekamp (K.B. 1936, 103).

## ORCHIDACEAE

The routine work has included the naming of collections from all parts of the world, and of living plants from the Gardens. This latter work will serve as a basis for the preparation of a new edition of the Orchid Handlist.

During the year Mr. H. N. Ridley presented his large and valuable collection of drawings of orchids, principally those of Malaya and of the Malay Peninsula. It includes drawings of the types of many of his new species and is the most complete collection in existence of drawings of Malay Peninsula orchids. The collection, which consists of over 1000 drawings, many of them coloured, is being written up and it is hoped to incorporate it early next year (see also under section "Illustrations and Portraits").

About 70 orchids collected in France were presented by Dr. A. F. G. Kerr.

*Research.*—The outstanding species remaining from work on the "Flora of West Tropical Africa" were described and published

during the year. The account of the orchids of the Swedish Expedition to Southern Rhodesia is almost completed and will be published in Sweden with the accounts of other collections of the expedition. Research is still being continued on African orchids, particularly the genus *Habenaria* and various Angraecoid genera, and also on the orchids of Burma, Siam and the neighbouring regions.

Messrs. T. Tang and F. T. Wang continued their work on the orchids of China and Japan.

*Publication*.—African Orchids : VIII (K.B. 1936, 221).

#### GRAMINEAE.

As in 1935, a large number of valuable collections were received from many parts of the world. Those from Africa, especially from east and south-tropical, once again have been the most numerous. Almost every collection, and noticeably those from the mountains of East Africa, included specimens of little-known or rare species. Amongst the more important of those collections which were entirely composed of grasses special mention may be made of the following :—About 1000 specimens of North Indian grasses collected by the late Col. G. Wingate and presented by his daughter, Miss R. O. Wingate ; several hundred grasses from Assam, Singapore, Hong Kong and Honolulu, from Dr. N. L. Bor ; Queensland grasses from Mr. C. T. White, Brisbane and Mr. S. T. Blake, Brisbane ; 64 Australian grasses from the National Herbarium, Melbourne ; a few specimens from the Hoggar Mountains, Central Sahara, presented by Dr. R. Maire ; a small collection of grasses from the Imatong Mtns., Sudan, collected by Mr. H. B. Johnston ; a very important collection of over 500 specimens from the neighbourhood of Zomba, Nyasaland, collected by Mr. A. B. Cormack ; Northern Rhodesian grasses from Miss L. M. Seaton, Broken Hill ; S. Rhodesian and S. African grasses from the Botanical Museum, Lund ; South-West African grasses collected by Dr. G. Boss ; Seychelles grasses from Mr. F. L. Squibbs ; 240 Central and South American grasses from the United States Department of Agriculture, Washington, including co-types of several new genera and species ; 24 Argentine grasses from Professor L. R. Parodi ; 139 specimens of U.S.S.R. grasses from the Academy of Sciences, Leningrad, including syntypes or authenticated specimens of many species described in recent years by Russian botanists. Collections of seed and/or specimens of several cereals (*Oryza*, *Sorghum* and *Pennisetum*) have been received from the Departments of Agriculture in N.S.Wales, Gold Coast and Gambia, and from Mr. R. E. Massey, Sudan.

The preparation of vol. 10 of the " Flora of Tropical Africa " has been continued. The first part, containing the account of the

genera of the *Arundinelleae*, *Aveneae*, *Arundineae* and *Agrosteae*, is in the press and should be published early in 1937. It has not been possible to spend much time on the study of Australian grasses, but a revision of the genus *Ectrosia* and an account of the new genus *Thaumastochloa* have appeared in "Hooker's Icones Plantarum." Several interesting new genera of African grasses have been described in the "Kew Bulletin" (*Hypseochloa*, *Oryzidium*, *Phaenanthoecium*) and "Hooker's Icones Plantarum" (*Cymbosetaria*, *Apochiton*). The account of the genus *Apochiton* also included a key to and an enumeration of the genera of the *Eragrosteae*. A revision of the South African species of *Helictotrichon* (*Avenastrum*) has been prepared by Dr. H. G. Schweickerdt and will appear in the next part of "Bothalia." The South African material of *Aristida*, amounting to several thousand sheets, has been received on loan from the more important herbaria in South Africa. It is being critically examined and compared with authentic specimens by Dr. Schweickerdt. In addition to the research mentioned above, several thousand determinations have been made and 2,170 sheets of grasses laid-in in the Herbarium.

Dr. N. L. Bor spent several months studying Assam grasses in order to prepare an account of the *Gramineae* for the "Flora of Assam." Mr. R. E. Vaughan was engaged for some time in examining specimens from Mauritius, for a paper on the grasses of that island. Mr. J. D. Snowden completed his monograph of the "Cultivated Races of Sorghum," and his volume on the subject was published in May. He was good enough to give voluntary help in naming various collections of sorghums received in the early part of the year, and in the revision of the Uganda material of several genera for a manual of the grasses of that country.

*Publications.*—The Cultivated Races of Sorghum, by J. D. Snowden. (Published by the Bentham-Moxon Trustees).

Some Uncommon British Grasses (Proc. Linn. Soc. 1935-36, 108).

*Spartina Townsendii* and *S. brasiliensis* in Warm Countries, by J. Bryce (K.B. 1936, 21).

Two New *Arundinarias* from Yunnan, by Y. L. Keng (K.B. 1936, 106).

The Bamboo Genera, *Dinochloa* and *Melocalamus*, by F. A. McClure (K.B. 1936, 251).

Notes on African Grasses : XIX (K.B. 1936, 293).

Notes on African Grasses : XX (K.B. 1936, 500).

#### PTERIDOPHYTA.

Work on the new edition of the "Handlist of Ferns in cultivation at Kew" has been carried on systematically throughout the year.

This has involved a great deal of taxonomic and nomenclatural study, since it was considered desirable to check the name of every specimen listed from the Gardens. Many identifications have been corrected, and many nomenclatural changes have been found necessary in order to bring the list into line with C. Christensen's "Index Filicum." Two specimens of every species represented are being dried and mounted to form reference sets. One of these sets will be kept in the Ferneries and the other will be placed in a special cabinet in the Herbarium. Such a reference collection will be of value in connection both with enquiries as to cultivated specimens and with the acquisition of new material.

The following collections were received at the Herbarium during the year : 142 specimens of ferns collected in St. Vincent, presented by Mr. E. C. Phillips ; 400 mounted sheets of cultivated ferns collected and presented by Mr. C. H. Curtis ; 860 sheets of ferns from the N.W. Himalayas, mainly from the herbarium of Mr. T. Bliss, presented by Mrs. G. Belcham ; a collection of Jamaican ferns collected by Capt. W. S. Close, presented by his daughter Miss M. Close.

During the year, 1,500 sheets were incorporated, while the large number still to be laid in have been sorted into genera and arranged in separate cabinets.

#### MUSCI, HEPATICAE AND CHAROPHYTA.

The third and fourth series of Musci Selecti et Critici and the ninth and tenth series of Hepaticae Selectae et Criticae issued by Dr. Fr. Verdoorn have been purchased. Other purchases include Costa Rican mosses from Dr. A. F. Skutch, and Aleutian Island mosses from Mr. W. J. Eyerdam. Mr. F. Rilstone presented a number of hepatics and mosses from various parts of the world. The New Zealand Department of Agriculture sent specimens of recently described bryophytes, and the New York Botanical Garden sent a number of Fijian hepatics and mosses.

Mr. G. O. Allen has very kindly co-operated with the *Charophyta* as in former years.

A complete series of copies of more than five hundred drawings made by Dr. Fr. Verdoorn in the course of his monographic work on the *Frullaniaceae* and *Lejeuneaceae* have been purchased from the funds of the Bentham-Moxon Trustees and the Janet Perkins Bequest. These, together with the large series of the late Dr. Stephani's drawings of *Lejeuneaceae*, will be of considerable assistance in supplementing the descriptions, especially in the many cases where the species are unrepresented by specimens at Kew.

## THALLOPHYTA.

LICHENS AND ALGAE.—Several parcels of lichens were received in exchange. The Botaniska Museum, Helsingfors, sent 150 specimens, being fascicles 1-3 of *Lichenes Fenniae Exsiccati*, and the Riksmuseum, Stockholm, sent a number of Brazilian lichens. Small collections of algae have been presented from Uruguay, Barbados and Ceylon. Lichens and algae for naming were received from S. Australia, Canada, Somaliland, Sudan and China. Professor T. A. Stephenson who for some time has been sending S. African algae, has extended the range of his investigations to Natal and to Port Nolloth on the W. coast. From these areas good sets of specimens were sent in return for determinations supplied.

A number of enquiries during the year have related to seaweeds used in commerce.

Material sent on loan included *Stictaceae* to Dr. H. Allan, New Zealand; *Iridaea* spp. to Prof. W. A. Setchell, California; freshwater genera to Prof. W. Troll, Munich; *Trentepohlia* spp. and *Chondrus* spp. to Dr. O. Schmidt, Berlin; *Fucus* spp. to Miss M. J. Lynn, Belfast; numerous sheets from the Leighton herbarium to the Natural History Museum, Vienna, for Dr. K. Redinger, and a large number of lichens of various genera to the National Museum of Natural History, Paris, for examination by Dr. J. Reichert, of Palestine.

Eight thousand cards of Tilden's *Index Algarum Universalis* were purchased. These have been sorted and incorporated with the previous part of the index.

FUNGI.—The outstanding addition was Mr. W. B. Grove's complete herbarium of *Coelomycetes*, consisting of 3,529 specimens both British and foreign. This has been presented to Kew by the Bentham-Moxon Trustees and was received at the end of the year. Other donations included a set of 100 *Basidiomycetes*, chiefly *Thelephoraceae*, from Professor H. S. Jackson of the University of Toronto, a small set of *Basidiomycetes* from the Central Experimental Farm, Ottawa (Miss I. Mounce), *Clavariaceae* from Iowa (Prof. G. S. Martin) and various interesting microfungi from Dr. Malcolm Wilson.

Collections of fungi for determination have been received from South Africa (Department of Agriculture, Pretoria), Uganda (Mr. C. G. Hansford), and Canada (Prof. H. S. Jackson and Miss I. Mounce), and critical *Thelephoraceae* from various correspondents in the United States.

During the early part of the year some considerable time was given to questions of fungus nomenclature, in connection with queries received from Dr. Connors of the Central Experimental Farm, Ottawa.

Much time has had to be devoted to protecting the mycological herbarium from attacks of beetles, which prevented progress being made with laying in and the work of renovating old sheets and covers.

*Publications.*—African Fungi collected by O. A. Høeg, 1929–30 (Forhandl. K. Norske Vidensk. Selsk., 9, 42–53, 1936).

Second List of Fungi and Diseases of Economic Plants in Tanganyika Territory, by G. B. Wallace (K.B. 1936, 234).

Preliminary List of Fungi and Diseases of Plants in Sierra Leone, by F. C. Deighton (K.B. 1936, 397).

List of Fungi collected in Sierra Leone, by F. C. Deighton (K.B. 1936, 424).

### SPIRIT COLLECTION.

The rapid growth of this valuable collection has necessitated the provision of additional storage room and the cellar below Wing B is being prepared to house a portion of the collections. 614 bottles have been added during the past year. The collection of *Orchidaceae* is making particular progress, and now includes species belonging to 258 of the 600 (approx.) recognised genera. Other valuable series include *Asclepiadaceae* (Tribe *Stapelieae*) and the genera *Campanula* and *Arisaema*. There are also a considerable number of type specimens, as well as material figured in various publications. An endeavour is being made to obtain a complete spirit collection of the various succulent plants in cultivation at Kew, since dried specimens of these groups are often of little value. A commencement has been made with *Cactaceae* and the genera formerly grouped under *Mesembryanthemum*.

### EXPERIMENTAL AND TRANSPLANT WORK.

Genetical research was continued at the Potterne Biological Station and at Kew on *Silene*, *Centaurea*, *Ranunculus*, and *Saxifraga*. Several lines of research in *Silene* were completed by the scoring of  $F_2$  and back-cross families, and work on further foreign stocks, their selfing, and their hybridization with British plants was commenced. In *Centaurea* the last of the  $F_2$  families were scored and arrangements made to complete the experimental part of the planned studies in this genus by 1941. Mr. E. M. Marsden-Jones is continuing research at Potterne on *Anagallis* (with Prof. F. E. Weiss), on *Solanum Dulcamara*, and on *Epilobium*. Investigation of the apomicts, microspecies, and variations of *Taraxacum* and *Chrysopsis* was continued at Kew.

The Transplant Experiments of the British Ecological Society at Potterne have completed the ninth year of their existence. The fourth biennial report is in press (Dec. 1936).

*Publications.*—Contacts between Plant Classification and Experimental Botany (Nature, 137, 563 : 1936).

Solanum Dulcamara and its Inflorescence (Bot. Soc. and Exch. Club 1935 Report, 82 : 1936).

Natural Selection and the Distribution of Plants (Proc. Roy. Soc. B. 121, 49 : 1936).

Researches on *Silene maritima* and *S. vulgaris* : XVI (K.B. 1936, 445).

#### SUMMARY.

The routine work, apart from naming, accomplished during 1936 is summarised as follows :—

Mounted	...	...	...	...	42,550 (approx.)*
Incorporated	...	...	...	...	40,350 (approx.)*
Duplicates distributed	...	...	...	...	15,176
Specimens received on loan	...	...	...	...	15,004
Specimens sent on loan	...	...	...	...	6,561
Specimens presented or purchased	...	...	...	...	57,269

\*Not including lower cryptogams.

#### FUMIGATION OF THE STORES.

During the autumn of 1936 a somewhat serious attack of insects was discovered in the stores. Specimens were submitted to Dr. A. B. Page of the Imperial College of Science and Technology, who reported that more than one species was present, but the damage appeared to be due almost exclusively to the ordinary herbarium beetle, *Sitodrepa panicea*. Dr. Page advised fumigation with hydrogen cyanide, and as there was such a vast mass of absorptive material in the building he recommended an unusually high concentration of gas, namely 30 oz. HCN per 1,000 cubic feet.

The work of fumigation was entrusted to the London Fumigation Company who undertook to carry out all the details of the operation. Zyklon was employed. The actual work was in charge of Mr. W. J. Rogers, and the following notes are based on a report submitted by him.

The stores were put under gas on December 1st and opened up on December 3rd, a competent operator being left on watch to act in the event of emergency. Three men were sent to seal up all cracks and crevices on November 30th, and a few floorboards were taken up on each floor to permit free circulation of gas between the

floors and the ceilings. The basement was also fumigated to ensure the necessary concentration being maintained on the ground-floor. The heat was left on.

The specimens were removed from contact with the walls, firstly to allow of ample air-space around the bundles, and to permit of a free penetration of gas from all sides ; and secondly, to assist subsequent dispersal of gas.

As it was feared that with so heavy a concentration the Zyklon lachrymator was likely to linger in the bundles after the premises had been passed as free from the dangerous HCN content, it was decided to use a certain proportion of Zyklon without lachrymator. Tins of Zyklon were placed in the various rooms on the morning of December 1st, the number of tins in each room varying according to the capacity of the room. Four men were detailed to open the tins and scatter the Zyklon. Under normal conditions two men would have sufficed to carry out this operation, but as the mask filters were not guaranteed to give protection for more than half the concentration used on this occasion, it was considered advisable for the men to work in pairs. One pair opened the tins in one room and proceeded to another gas-free room to change filters and to be on hand in case of accident. The second pair started only when the first pair were in the gas-free room. The first pair then waited for the other pair to pass them before starting on the third room—and so on. No difficulty was experienced during the dosing.

All Zyklon was distributed by 11.30 a.m. on December 1st. The building was opened for ventilation at 7.30 a.m. on December 3rd. Weather conditions were good, there being a fresh breeze and initial ventilation was rapid. Final clearance (" free for working purposes ") was given on Saturday, December 5th, and check inspection was made on Monday, December 9th.

The figures were as follows :—

Capacity (Fumigation) ...	21,750 cu. ft.
Zyklon used ... ..	12 tins, 1,000 gms. each, HCN without lachrymator.
	7 tins, 1,000 gms. each, HCN with lachrymator.
	2 tins, 500 gms. each, HCN with lachrymator.

A certain number of tests were made during the fumigation, with both adults and larvae of *Sitodrepa panicea*. The insects were placed in envelopes of gas-proof paper and placed in the centre of bundles of specimens and carefully tied up. No signs of life were visible after the fumigation, whereas control specimens placed in similar envelopes in bundles which were not fumigated remained alive.



The work of fumigation was carried out with great care and precision by the London Fumigation Company. The entire cost was £30, and the results appear to be entirely satisfactory.

#### ILLUSTRATIONS AND PORTRAITS.

A large number of drawings and photographs were received during the year and incorporated in the collection. These include: 75 water-colour drawings prepared for the "Botanical Magazine", presented by the Royal Horticultural Society; about 90 original water-colour drawings of plants from the Italian Riviera, presented by Mrs. S. E. Miller; 106 sheets comprising about 165 water-colour drawings of *Narcissus*, *Lilium*, etc., by Walter Meyrick Meyrick-Jones, presented by his brother Dr. H. Meyrick-Jones through Professor Sir A. C. Seward; 30 plates of the "Flowering Plants of South Africa" from Dr. Pole-Evans; 25 photographs of plants from the Atlas Mountains, presented by Dr. R. Seligman. Copies of "Hooker's Icones Plantarum" were received from the Bentham-Moxon Trustees.

Mr. H. N. Ridley presented a collection, numbering about 1,500, of his original drawings, chiefly of *Orchidaceae*, *Cyperaceae*, *Scitamineae*, etc., and these will shortly be incorporated in the collection.

The Bentham-Moxon Trustees, with the assistance of the Janet Perkins Bequest, presented 505 tracings of original drawings of *Frullaniaceae* and *Lejeuniaceae* which were purchased from Dr. F. Verdoorn's private collection.

Photographs of types were received from the Imperial Forestry Institute, Oxford, the Missouri Botanical Garden, and Dr. C. Christensen, and many other photographs and drawings from various sources were also received and incorporated in the collection.

#### NOMENCLATURE AND BIBLIOGRAPHY.

In any year following an International Congress there are naturally very many outstanding nomenclature problems to be solved. At Amsterdam in 1935 Miss M. L. Green was appointed Secretary of two International Committees: The Special Committee for Phanerogamæ and Pteridophyta, and that for The Nomenclature of Economic Plants. Very satisfactory progress has been made. The members of the Special Committee for Phanerogamæ and Pteridophyta have investigated all cases of proposed *nomina generica conservanda* submitted to the Amsterdam Congress. The cases for and against the conservation of these names are to be found in Kew Bull. 1935 83-88; Sprague, Synopsis of Proposals, 68-73; and Prelim. Opin. 25; and the proposed *nomina generica homonyma conservanda* are contained in Kew Bull. 1935, 341-544. Altogether over 340 names

were considered for conservation. All these cases have been investigated in detail, and as the Committee was appointed with full power of decision (see Proc. Int. Bot. Congr. 1, 359 : 1936) it is now possible to publish a list of those names that have been conserved or rejected. This list will appear shortly in the "Kew Bulletin." In the meantime any botanist desiring to know whether a particular name has been conserved or not, may obtain full information by writing to the Secretary.

The Committee has also completed its investigation on the *nomina conservanda proposita* published in the International Rules, ed. 3, pp. 131–138. The report on these names will also be published shortly. The Committee has now under consideration the lists of *nomina ambigua* and *nomina confusa*, also the proposed changes in the list of standard species of Linnean generic names (*Phanerogamae*), and the examination of the list of standard species of *nomina generica conservanda*.

The work entrusted to the Members of the Special Committee for The Nomenclature of Economic Plants is well in hand, but owing to its very nature it must take some time to complete. Since some confusion exists amongst botanists as to this work, the text of the resolution adopted at Amsterdam may be quoted:—"That an International Committee be appointed to draw up a list of names of economic plants according to International Rules, and that this list may remain in use for a period of ten years."

A large number of lists containing names of economic plants has been received by the Secretary, including those sent by Dr. Burt Davy on behalf of many Forestry Institutions throughout the Empire, by the Pharmaceutical Society and by the staff of the Museums of the Royal Gardens, Kew. Altogether over 3,000 names have been received. The method of procedure adopted has been as follows:—names have been card-indexed and the duplicates removed; the cards were then arranged alphabetically and divided into seven portions, one for each member of the committee. Each portion was typed out and sent to the member responsible for investigating the names. In order to save time the lists were dealt with in two instalments. Many members have returned instalment 1, and three portions of instalment 2 have also been returned, the names having been duly examined and corrected where necessary. When all names have been returned, it is intended to circulate the entire list to all members of the committee in order to obtain as high a degree of accuracy as may be possible. The card index with corrections up to date is available for consultation by the staff at Kew and by visitors.

There have been numerous nomenclatural enquiries throughout the year, and often the replies to these entail extensive research. In addition many lists of names intended for publication have been received for examination and correction.

The revision of the "Handlist of Coniferae and other Gymnosperms" has been completed, and the MS. sent to the printers.

Two members of the Staff became foundation members of the Society of Bibliography of Natural History which was founded in 1936.

*Publications.—Nomenclature*: Principal decisions concerning Nomenclature made by the Sixth International Botanical Congress (K.B. 1936, 185–188).

A note on the Himalayan Daphnes, including a note on typification (K.B. 1936, 441).

On the names of *Lilium Bolanderi* and *Lilium Kelloggii* (Lily Year-Book, 1936, 6).

*Bibliography*: Dates of Hooker's "Botanical Miscellany" (K.B. 1936, 85–95).

Johan Sebastian Miller's "Icones Novae" (Journ. Bot. 1936, 208).

A catalogue of papers concerning the dates of publication of natural history books (Botany by H. S. Marshall) (Journ. Soc. Bibliogr. Nat. Hist. 1, pt. 1 : 1936).

*Terminology*: Technical terms in Ruellius' Dioscorides (K.B. 1936, 145–185).

#### INDEX KEWENSIS.

The compilation of Supplement 9 has proceeded steadily, and it is hoped that it will be completed early in 1937. The card catalogue is arranged alphabetically and is available for consultation by the staff and visiting botanists. The number of cards at the present time is approximately 37,000. This number of entries is already considerably larger than that included in the normal quinquennial supplement. The increase is accounted for partly by the addition of nearly two thousand names, which for one reason or another were omitted from the original Index and subsequent supplements. As pointed out in Kew Bull. 1934, App. 39, acknowledgment is due to the Bentham-Moxon Trustees for supplying extra help to investigate these omissions.

As is customary during the last year of the quinquennium, the compilers have visited the Libraries of the British Museum (Natural History) and of the Royal Horticultural Society to search through periodicals not received at Kew, and as a result a large number of names has been added. Preparation for the press has already been started on the generic names.

When the card index is complete a duplicate typed copy is prepared. This forms part of the permanent card index from 1921–1935, and also ensures against loss of the original cards in transit,

when printing is taking place. The Delegates of the Clarendon Press have again generously supplied help towards the expenses of the special typing required for the duplicate set of cards.

### VISITORS.

The number of signatures in the Visitors' Book for the year 1936 was 5,479.

The following gave voluntary assistance :—Mr. H. N. Ridley again kindly assisted in naming Malayan specimens and Miss M. M. Whiting in arranging and classifying the Indo-Malayan material; Miss D. A. Chaytor and Mr. R. A. Blakelock gave assistance in the European section; Mr. D. P. Fanshawe assisted in naming European and other collections, and Mr. J. D. Snowden in the work on *Gramineae*; Miss M. D. Ker also again helped in the work of labelling Mr. Hubbard's large Australian collection.

Amongst frequent or regular visitors were members of the staffs of the Department of Botany, British Museum, the Imperial Mycological Institute, and the Imperial Forestry Institute, Oxford. The Staff employed by the Royal Horticultural Society in connection with the preparation of the Index Londinensis and the Botanical Magazine have worked in the Herbarium and Library throughout the year.

The most noteworthy or frequent visitors to the Herbarium were the following :—

Mr. A. H. G. Alston; Major G. Aylmer (Sudan).

Mr. E. G. Baker; Prof. E. Barnes (Madras); Mr. J. Bausch; Mr. W. J. Bean; Dr. G. Benl (Munich), Dr. G. R. Bisby, Dr. W. E. Blackall (Cottesloe, W. Australia); Mr. R. A. Blakelock; Dr. K. B. Boedijn (Buitenzorg); Dr. F. Boergesen (Copenhagen); Dr. N. L. Bor (Indian Forestry Service, Shillong, Assam); Mr. J. P. M. Brennan; Miss E. M. Bruce; Professor A. H. R. Buller (Winnipeg); Mr. I. H. Burkill; Mr. P. Buwalda (Gröningen).

Mlle. A. Camus (Paris); Miss D. A. Chaytor; Mr. J. Clausen (Stanford University, California); Mr. S. Clay; Miss L. M. Cranwell (New Zealand).

Dr. J. M. Dalziel; Mr. J. E. Dandy; Mr. A. G. Davis; Mr. F. C. Deighton (Sierra Leone); Mr. H. N. Dixon; Mr. H. L. Dunkley.

Mr. Michael Evanari (Hebrew University, Jerusalem); Mr. A. W. Exell.

Mr. W. P. Fang (Nanking); Mr. D. P. Fanshawe; Mr. M. A. Farghaly (Egyptian University, Cairo); Dr. H. R. Fletcher; Dr. B. Floderus (Stockholm).

Mr. H. B. Garrett (late Forest Office, Siam); Mr. W. B. Grove; Dr. Otto von Gumpfenberg (Berlin).

Mr. M. R. Henderson (Singapore) ; Mr. J. H. Holland ; Dr. D. Hooper ; Mr. A. C. Hoyle.  
 Miss J. B. Imlay.  
 Mr. A. Bruce Jackson.  
 Miss M. D. Ker ; Dr. A. F. G. Kerr.  
 Mr. A. Percy Lancaster ; Mr. G. Lawrence ; Mr. J. G. Lousley.  
 Mr. E. W. Mason ; Mr. C. Matthews ; Dr. H. N. Moldenke (New York) ; Mrs. E. T. Moldenke (New York) ; Mr. B. O. Mulligan ; Mr. H. Muyser.  
 Mr. A. H. Nasr (Egyptian University, Cairo) ; Mr. R. M. Nattrass (Cyprus).  
 Dr. H. R. Oppenheimer (Palestine).  
 Mr. T. Petch ; Mr. N. S. Pillans (Kirstenbosch) ; Mr. H. W. Pugsley.  
 Dr. J. Reichert (Palestine) ; Mr. H. N. Ridley.  
 Dr. Harold St. John (Hawaii) ; Mr. J. R. Sealy ; Prof. W. A. Setchell (Berkeley, California) ; Mr. W. A. Sledge ; Dr. N. J. G. Smith (Grahamstown) ; Mr. J. D. Snowden ; Miss M. S. Sprague ; Mr. W. T. Stearn ; Miss E. L. Stephens (Cape Town) ; Mr. W. T. Stevens ; Mr. C. F. Symington (Kepong, F.M.S.).  
 Mr. T. Tang (Peiping) ; Dr. G. Taylor ; Mr. H. Griffith Tedd (Xanthie, Greece) ; Mr. C. G. Trapnell (Mazabuka, N. Rhodesia).  
 Mr. F. T. Wang (Peiping) ; Mr. E. F. Warburg ; Dr. H. Weimarck (Lund, Sweden) ; Miss M. M. Whiting ; Mr. S. P. Wiltshire ; Mr. W. C. Worsdell.

#### DISTRIBUTION OF DUPLICATES.

The following were the principal institutions to which duplicates were distributed :—

*Great Britain.*—London, British Museum (Natural History) ; Oxford, Imperial Forestry Institute.

*Europe and Orient.*—Baku, Herbarium of the Academy of Sciences ; Berlin, Botanic Gardens and Museum ; Brno, Masaryk University ; Brussels, Botanic Garden ; Cluj, Botanical Museum ; Geneva, Museum and Botanic Garden ; Jerusalem, Hebrew University ; Kraków, Physiographical Museum ; Leiden, 's Rijks Herbarium ; Leningrad, Botanical Institute of the Academy of Sciences ; Madrid, Botanic Garden ; Paris, Natural History Museum ; Sarajevo, State Museum ; Stockholm, Natural History Museum ; Uppsala, Botanical Institution ; Utrecht, Botanical Museum and Herbarium ; Vienna, Natural History Museum.

*Asia.*—Buitenzorg, Botanic Gardens ; Manila, Bureau of Science , Sapporo, Botanical Institute of the Faculty of Science, Hokkaidō Imperial University.

*Africa*.—Amani, East African Agricultural Research Station ; the Government of British Somaliland ; Pretoria, Division of Plant Industry.

*America*.—Bloomington, Indiana University ; Buenos Aires, Botanical Laboratory of the Faculty of Agriculture ; Cambridge, Gray Herbarium ; Chicago, Field Museum of Natural History ; Jamaica Plain, Arnold Arboretum ; La Plata, Museo de la Plata ; Los Angeles, University of California ; New York, Botanical Garden ; Ottawa, Central Experimental Farm ; Stanford University, Dudley Herbarium ; Toronto, The University ; Washington, D.C., United States National Museum.

*Australia and New Zealand*.—Brisbane, Botanic Museum and Herbarium ; Melbourne, National Herbarium ; Palmerston North, Plant Research Station.

*Oceania*.—Honolulu, Bernice P. Bishop Museum.

## The Library

The Library staff has been strengthened by the addition of a sub-assistant, and this has made it possible to take in hand various arrears of work.

A good start has been made in dealing with the arrears of cataloguing mentioned in last year's report, several hours being devoted daily to this task by the Assistant Librarian. In this connection a large number of pamphlets which had been for many years on shelves on the cellar landing have been removed and classified so that they are more readily available while awaiting cataloguing.

The press-marking of the books in the Library, made necessary by the subject rearrangement, has now been completed, except for the periodicals in the three corridors. Before these could be attended to it was necessary to relieve congestion. This was done by removing to the Museums Library the "Bulletin Economique de l'Indochine" from the Top Corridor, and one little-used periodical from each of the other corridors to the remaining vacant shelves on the cellar landing. Another necessary preliminary to the new press-marking of these publications was their spacing out to allow for the annual expansion of those still current. These tasks have been completed for the middle corridor, and the journals in the other two corridors are being similarly dealt with.

Three bibliographical papers published during 1936 are included under the heading "Nomenclature and Bibliography" (p. 576), as they deal with dates of publication of works containing new botanical names.

## PRESENTATIONS TO THE LIBRARY.

The trustees of the British Museum :—W. Fawcett and A. B. Rendle, *Flora of Jamaica*, vol. 7, Dicotyledons, part 5, 1936.

The Crown Agents for the Colonies :—D. A. Bannerman, *The birds of Tropical West Africa*, vol. 4 ; J. Hutchinson and J. M. Dalziel, *Flora of West Tropical Africa*, vol. 2, pt. 2 (4 copies) ; *Vocabulary of Nigerian names of trees, shrubs, and herbs*.

Lieut.-Col. Sir David Prain, as in previous years, has sent various periodicals in continuation, and numerous other publications.

Two copies of the *Lily Year-Book* for 1935 (No. 4) and 1936 (No. 5) have been received from the Royal Horticultural Society. The Society has also presented a copy of *Cherries and soft fruits*, edited by F. J. Chittenden.

The Rhododendron Association has presented its *Year Book and Supplement*, 1935.

Among the publications received from the New York Botanical Garden during 1936 are *Addisonia* and the *North American Flora*, both in continuation.

Volumes 4 and 5 of the *Flora U.R.S.S.* and other works have been presented by the Botanical Institute of the Academy of Sciences, Leningrad.

Mr. H. Hamel Smith very kindly presented a collection of about 50 books on Temperate and Tropical Agriculture.

From the Director, Imperial Mycological Institute, Kew, have been received volumes 1, 2, 4, 5, and Index to volumes 1–4 of the *Flora U.R.S.S.*

During 1936 the Bentham-Moxon Trustees presented to the Library the following important works :—Barrere, P., *Essai sur l'histoire naturelle de la France equinoxiale*, Paris, 1741, an important early work on the flora of French Guiana ; Bennett, F. D., *Narrative of a whaling voyage round the globe*, London, 1840, 2 vols., with an appendix describing the botany ; Castellan, P., *Vitae illustrium medicorum*, Antwerp, 1618, containing accounts of the lives of early botanists ; Commelyn, C., *Horti medici Amstelædamensis Plantarum usualium catalogus*, Amsterdam, 1724, is the third edition of this work ; Descemet, J., *Catalogue des plantes du Jardin de Messieurs les Apoticaire de Paris*, 1759 ; Gesner, C., *Apparatus et Delectus Simplicium*, Basel, 1540, an important work in which the preparation and collection of many plants used medicinally are described. It is bound up with Gesner's edition of *Actuarii* (translated by Ruellius), *De medicamentorum compositione*, and forms a valuable addition to our set of Gesner's works ; Grapaldus, F. M., *De Partibus Aedii*, Strassburg, 1508, an early work which in spite of its architectural sounding title deals with spices, herbs, vegetables, fruits, beans and grains ; Hebenstreit, J. E. (1) *De methodo plantarum ex fructu optima*, Lipsiae, 1740, and (2) *Definitiones plantarum*, Lipsiae, 1731,

bound up with the same author's *De sensu externo facultatum in plantis indice*, Lipsiae, 1730 ; Heister, L. (1) *Catalogus plantarum*, and (2) *Designatus plantarum quibus hoc anno MDCCXXI Hortum Academiae Iuliae* ; Ludwig, C. G., *Observationes in methodum plantarum sexualium*, Lipsiae, 1739, a work of historical importance ; Meissner, R., *Eine Deutsche Apothek des 16. Jahrhunderts*, Berlin, 1908, containing an account of the drugs employed in the composition of medicines used in the State Drug Shop at Kolberg in 1589 ; Mizauld, A., *Le Jardin medicinal*, Paris, 1578, has both a medical and a botanical interest and deals with the medicinal virtues of vegetables, herbs, fruits and flowers ; Plaz, A. G., *Foliorum in Plantis Historiam*, Lipsiae, 1740, deals with the morphology and terminology of leaves and is useful in interpreting contemporaneous descriptions ; Snowden, J. D., *The Cultivated races of Sorghum* (2 copies) ; Wollenweber, H. W., and O. A. Reinking, *Die Verbreitung der Fusarien in der Natur*, Berlin, 1935, together with plates 1,101–1,200 of Wollenweber's *Fusaria autographice delineata*.

The continuation of various periodicals, received in exchange for *Hooker's Icones Plantarum*, have been presented by the Bentham-Moxon Trustees, and also vols. 1 to 7, No. 4, of the *Journal of the Cactus and Succulent Society of America*.

The Editor of "Nature" has presented the following works :—H. Clinton-Baker and A. B. Jackson, *Illustrations of new conifers* ; Merle E. Coulter, *The story of the plant kingdom* ; E. H. M. Cox, *A history of gardening in Scotland* ; Lady Elphinstowe, *Botany for children* ; H. Gilbert-Carter, *Our catkin-bearing plants* (ed. 2) ; A. Guillaumin, *Les fleurs de jardins* ; H. E. Jacob, *The saga of coffee* (translated by Eden and Cedar Paul) ; H. McMinn and Evelyn Maino, *An illustrated manual of Pacific Coast Trees* ; F. K. Makins, *The identification of trees and shrubs* ; Harriett Price, *The junior gardener* ; Edith A. Roberts and Julia R. Lawrence, *American Ferns : How to know, grow and use them* ; W. Troll, *Vergleichende Morphologie der höheren Pflanzen*.

The following books have been received from the publishers, chiefly for review in the Kew Bulletin :—Allwood Bros. : M. C. Allwood, *Carnations and all Dianthus* ; Messrs. Edward Arnold : N. M. Comber, *An introduction to the scientific study of the soil* (ed. 3) ; H. Martin, *The scientific principles of plant protection, etc.* ; John Bale Sons & Danielsson : R. H. Crofton, *A pageant of the spice islands* ; G. D. Gray, *All about the Soya bean* ; Gebrüder Borntraeger : Engler-Diels, *Syllabus der Pflanzenfamilien*, 11 Auflage ; Chapman & Hall : A. L. Winton and K. B. Winton, *The structure and composition of foods* (vol. 2). *Vegetables, Legumes, Fruits* ; Country Life : E. A. Bunyard, *Old garden roses* ; D. Wilkie, *Gentians* ; Messrs. Macmillan : L. J. F. Brimble, *Intermediate botany* ; Sir Frederick Keeble and A. R. Rawes, *Hardy fruit growing* ; Louis C. C.



Krieger, *The mushroom handbook* ; Loraine E. Kuck and R. C. Tongg, *The tropical garden* ; E. Markham, *Raspberries and kindred fruits* ; L. Rowntree, *Hardy Californians* ; A. Sharples, *Diseases and pests of the rubber tree* ; McGraw-Hill Book Co. : R. P. Wodehouse, *Pollen grains* ; Oxford University Press : H. Gilbert-Carter, *British trees and shrubs, etc.* ; The Pharmaceutical Press : H. N. Linstead, *Poisons law ; a guide to the provisions of the Pharmacy and Poisons Acts, 1852 to 1933, and the Dangerous Drugs Acts, 1920 to 1932, for the use of Pharmacists, etc.*

Among the more important works received, presented by the authors unless otherwise stated, are the following : J. R. Ainslie, *Notes on native medicinal plants of Nigeria* (typescript) (from Dr. F. N. Howes) ; H. H. Allan, *An introduction to the grasses of New Zealand* (from the Department of Scientific and Industrial Research) ; O. Ames, *The genus Epidendrum in the United States, etc.* ; Enrique Perez Arbelaez, *Plantas útiles de Colombia*, vol. 1, 2 copies (from Ministerio de Agricultura y Comercio, Republica de Colombia) ; C. A. Backer, *Voorlooper eener Schoolfiora voor Java* (from Dr. D. F. van Slooten) ; J. G. Baker, (1) *Handbook of the Amaryllideae* ; (2) *Handbook of the Irideae* (interleaved copies from Mr. E. G. Baker) ; E. Battiscombe, *Trees and shrubs of Kenya Colony* (from the Conservator of Forests) ; R. H. Beddome, *The ferns of Southern India*, parts 1-17 and 19-20 (presented by Mrs. Bartle Grant) ; R. Bentley, *A manual of botany*, ed. 5, 1887 (from Mr. H. K. Airy-Shaw) ; F. Børgesen, *Marine algae from the Canary Islands, etc.*—IV. : *Cyanophyceae* ; *Botaniska Studien tillägnade F. R. Kjellman den 4 November, 1906* (from Botaniska Institutionen, Uppsala) ; *British Association for the Advancement of Science : A scientific survey of Blackpool and district, by various authors* (from Dr. W. B. Turrill) ; N. L. Britton and E. P. Killip, *Mimosaceae and Caesalpiniaceae of Colombia* (from Miss D. Oak) ; N. E. Brown's MS. on *Aloe brevifolia* Mill. (from Dr. J. Muir) ; H. G. Bull, *The mistletoe in Herefordshire* (Trans. Woolhope Nat. Field Club, 1852-1865) (from Dr. H. E. Durham) ; *Catalogue of British Scientific and Technical Books*, ed. 3, 1930 (from the Secretary, British Science Guild) ; L. Chalk and J. Burt Davy (Editors), *Forest trees and timbers of the British Empire. III.* (from the Librarian, Imperial Forestry Institute, Oxford) ; A. Chevalier, *Les Iles du Cap Vert. Flore de l'Archipel* ; G. R. Clarke, *The study of the soil in the field* (from the Imperial Forestry Institute) ; Mabel C. Coleclough, *A book of New Zealand Flora, etc.* ; A. X. P. Coutinho, *Esbôço de uma Flora Lenhosa Portuguesa* ; K. Domin, *Plantarum Cechoslovakiae Enumeratio* (Preslia 13-15) ; Sir Charles Fawcett, *The English factories in India.* vol. 1 (new series) (*The Western Presidency*) 1670-1677 (from The Secretary of State for India) ; *Field notes of Rhododendrons and other plants collected by Kingdon Ward in 1935* (from Lionel de Rothschild) ; H. Fröderström, *The genus Sedum L.* ; W. W. Froggart, *Forest insects and timber borers*

(from Miss T. Y. Harris and Miss Crommelin, George Girls High School, Kogarah) ; J. S. Gamble, *Flora of the Presidency of Madras*, part 11,...by C. E. C. Fischer (from the Secretary of State for India) ; P. Girod, *Manipulations de Botanique*, ed. 1, 1887 (from Mr. H. N. Ridley) ; D. H. Grist, *An outline of Malayan agriculture* (from Director of Agriculture, S.S.), *Handbook to British Malaya*, 1935 (from The Agent, The Malayan Information Agency) ; L. Hauman, *Les "Senecio" arborescents du Congo. (Résultats botaniques de l'expédition scientifique belge au Ruwenzori, 1932.—IV)* ; E. M. Holmes, *Catalogue of the Hanbury Herbarium* (from Mr. A. A. Bullock) ; J. S. Henkel and S. St. C. Ballenden, *An account of the plant ecology of the Dukuduku Forest Reserve, etc.* ; F. H. Hillman and Helen H. Henry, (1) *The more important forage plant seeds and incidental seeds commonly found with them.* (Photographs of drawings of seeds) ; (2) *A list of forage plant seeds and the incidental seeds commonly found with them* (from Principal Botanist in Charge, Bureau of Plant Industry, U.S. Department of Agriculture) ; A. B. Jackson, *Catalogue of the trees and shrubs (excluding Rhododendrons) at Borde Hill, Sussex* (from Lt.-Col. Stephenson Clarke) ; W. L. Jepson, *A Flora of California*, vol. 2, pts. 1 and 2 ; R. Kanehira, *Formosan trees*, revised ed., 1936 (from Department of Forestry, Government Research Institute, Taihoku, Formosa) ; J. D. Kennedy, *Forest flora of Southern Nigeria* (from the Chief Conservator of Forests, Nigeria) ; A. J. G. H. Kostermans, *Studies in South American Malpighiaceae, Lauraceae and Hernandiaceae, especially of Surinam* ; Langlet, O., *Studier över tallens fysiologiska variabilitet och dess samband med klimatet* ; Mrs. Man, *Album of drawings* (from Sir D. Prain) ; J. W. S. Marr, *The South Orkney Islands* (Discovery Reports X) from Mr. H. N. Dixon ; A. W. Menzies-Kitchen, *Land Settlement : A report prepared for the Carnegie United Kingdom Trustees* (from the Carnegie United Kingdom Trustees) ; H. W. Miles and Mary Miles, *Insect pests of glasshouse crops* (from the Editor, Mr. H. C. Long) ; H. N. Moldenke (1) *A monograph of the genus Callicarpa* ; (2) *A monograph of the genus Cornutia* ; (3) *A monograph of the genus Priva* ; H. J. Moore, (1) *The hardy perennials* ; (2) *The culture of flowers* ; S. Murbeck, *Nachträge zur Monographie der Gattung Verbascum* ; H. C. Navel, *Les principaux ennemis du Cacaoyer aux Iles de San-Thomé et de Principe* ; Fr. Noël, *Dictionnaire Latin-Français* (from Miss Harris Brown) ; J. Ohwi, *Cyperaceae Japonicae* ; L. R. Parodi, (1) *Las plantas forrajeras indígenas y cultivadas de la Republica Argentina* (from the Director, Universidad de Buenos Aires, Facultad de Agronomía y Veterinaria) ; (2) *Revision de las Gramineas argentinas del género "Sporobolus"* ; F. W. Pennell, *The Scrophulariaceae of Eastern Temperate North America* ; *Recueil dédié a M. le Prof. Dr. St. Petkoff au 70-e anniversaire de sa naissance* (from Dr. St. Petkoff) ; V. A. Reko, *Magische Gifte* (from Mr. H. N. Ridley) ; *Report of the British Association for the Advancement of Science, 1935* (from Miss E. M. Wakefield) ; Thekla R. Resvoll, *Norske Fjellplanter* (from Miss

Mary Rathbone); W. von Roeder, *Sukkulenten* (from Dr. von Poellnitz); A. J. de Sampaio, *Primeira Conferencia Brasileira de Protecção a Natureza*; C. Schröter, *Flora des Südens*; J. J. Smith, *Ericaceae* (reprinted from Nova Guinea xviii. Bot.); T. A. Sprague, *Report Subsection for nomenclature, Sixth International Botanical Congress, Amsterdam*; F. Stockmans, *Végétaux eocènes des environs de Bruxelles*; Susan G. Stokes, *The genus Eriogonum*; l'Abbe Tous-saint, *Ronces de l'Eure et de la Seine-Inférieure*; Y. Tsiang, *Notes on the Asiatic Apocynales* III.; I. Tsuboi, *Monograph of Bamboos*. English translation (from Mr. B. Y. Morrison, U.S. Department of Agriculture); *Vocabulary of Nigerian names of trees, shrubs and herbs* (from the Forest Department, Nigeria); Miss M. Walter, *Some Jamaica wild flowers*; W. Marshall Watts, *A school flora*, etc. (from Mrs. Brackett); H. Drysdale Woodcock and J. Coutts, *Lilies: Their culture and management*, (ed. 2, 1936), (from Country Life); R. E. Woodson, jnr., *Studies in the Apocynaceae*, IV.: *The American genera of Echitoideae* (from the Director, Missouri Botanical Garden).

The following periodicals, additional to those mentioned in recent reviews, have been received. These have been presented by the editors, societies or institutions issuing them unless otherwise stated: *Acta Phytogeographica Suecica* II & VI (from Bibliotekarie, Universitetsbiblioteket, Upsala) and III: 1, IV & V (from Dr. G. Einar Du Rietz); *Australian Forestry*, vol. 1, no. 1 (from Mr. C. E. C. Fischer); *British Fern Gazette*, 37 numbers (from Dr. F. W. Mansfield), and vol. 6, nos. 11 & 12, vol. 7, no. 1 (from Mr. C. H. Wright); *Bulletin de la Société Dendrologique de France*, nos. 89-93 (from Mr. W. J. Bean); *Chanousia*, Ann. no. 1, 1922-27 (from Prof. L. Vaccari); *Darwiniana*, vol. 2, nos. 2-3 (from Prof. L. R. Parodi); *Indian Forester*, alphabetical index to vols. 1-17 (from Mrs. Gamble); *Lavori del R. Istituto di Palermo*, I-III; *Revista de la Facultad de Agronomia y Veterinaria*, vol. 1, pts. 1-3; vol. 2, pts. 1-3 (from the Director, Universidad de Buenos Aires, Facultad de Agronomia y Veterinaria); *Skrifter om Svalbard og Ishavet*, nos. 9, 38, 39, 41, 43-48, 55, 56 (from Norges Svalbard og Ishavsundersøkelser, Observatoriet, Oslo); *Specchio delle Scienze o Giornale Enciclopedica di Sicilia* (Photostat copy of several pages on which descriptions of new species appear) (from Dr. J. H. Barnhart); *Svenska Växt-sociologiska Sällskapet's Handlingar*, vol. 8 (from Dr. G. Einar Du Rietz); *Sweet Pea Annual*, 1936; *Teysmannia*, vol. 30, pts. 7-12 & index (from Dr. C. G. G. J. van Steenis); *Travaux de l'Institut Botanique, édition medicale d'Etat*, vol. 1 (from the Université de Charkov).

Many publications have again been received from the Empire Cotton Growing Corporation, the Imperial Agricultural Bureaux and from many Departments of Botany, Agriculture and Forestry at home, in the overseas Empire, and in foreign countries.

A large number of botanical reprints have also been received from the authors.

Additional maps of the fifth (relief) edition have been received from the Ordnance Survey Office, Southampton. The War Office has also presented further maps as issued. Other maps received include a collection of 38, chiefly of Germany, from Col. F. R. Durham, four of Switzerland from Mr. W. M. Seyfried, two of the Belgian Congo from Dr. W. Robyns, four of Nyasaland made and presented by Mr. A. J. W. Hornby; one of Guerrero from Mr. A. A. Bullock; and one of the Belgian Congo from Mr. A. D. Cotton.

# ROYAL BOTANIC GARDENS, KEW.

## LIST OF STAFFS.

31ST DECEMBER, 1936

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### Head Office.

- DIRECTOR—SIR A. W. Hill, K.C.M.G., M.A., Sc.D., D.Sc. (Adelaide)  
F.R.S., F.L.S., F.R.S.N.Z., V.M.H.  
ASSISTANT DIRECTOR—J. S. L. Gilmour, M.A., F.L.S.  
ECONOMIC BOTANIST—H. C. Sampson, C.I.E. B.Sc., F.L.S.  
ASSISTANT BOTANIST—B. L. Burt, B.Sc.  
CLERK (HIGHER GRADE)—S. F. Ormsby.

### Herbarium and Library.

- KEEPER—A. D. Cotton, O.B.E., F.L.S.  
DEPUTY KEEPER—T. A. Sprague, D.Sc., F.L.S.  
BOTANISTS—Miss E. M. Wakefield, M.A., F.L.S.  
W. B. Turrill, D.Sc., F.L.S.  
C. V. B. Marquand, M.A., F.L.S.  
V. S. Summerhayes, B.Sc.  
Miss M. L. Green, B.A., F.L.S.  
F. Ballard, B.Sc.  
N. Y. Sandwith, M.A., F.L.S.  
C. E. Hubbard, F.L.S.  
E. W. B. H. Milne-Redhead, M.A.  
H. K. Airy-Shaw, B.A., F.L.S.  
C. E. C. Fischer (*India*).  
H. G. Schweickerdt, B.Sc., Ph.D., F.L.S. (*South Africa*).  
Miss H. M. L. Forbes (*South Africa*).  
ASSISTANT BOTANISTS—E. Nelves (*Library*).  
Miss C. I. Dickinson, B.A.  
A. A. Bullock, B.Sc.  
TEMPORARY ASSISTANT BOTANIST—A. R. Horwood, F.L.S.  
ARTIST—G. Atkinson.  
HON. ASSOCIATE (*Transplant and Breeding Experiments*)—E. M. Marsden-Jones, F.L.S.

### Jodrell Laboratory.

- ASSISTANT KEEPER—C. R. Metcalfe, M.A., Ph.D.

### Museums.

- KEEPER—J. Hutchinson, LL.D., F.L.S.  
ASSISTANTS—F. N. Howes, D.Sc.  
R. Melville, B.Sc., Ph.D.

### Gardens.

- CURATOR—J. Coutts, V.M.H.  
ASSISTANT CURATORS—A. Osborn (*Arboretum*).  
C. P. Raffill, A.H.R.H.S. (*Temperate*).  
L. Stenning (*Tropical*).  
G. W. Robinson (*Herbaceous*)  
Vacant (*Greenhouse and Ornamental*).  
CLERK (HIGHER GRADE)—R. F. Williams.

# INDEX.

## A.

- Acacia cuernavacana* Sandwith, 8.  
*Achimenes antirrhina* Morton, 11.  
 — *bella* Morton, 11.  
 — *flava* Morton, 13.  
 — *fimbriata* Rose ex Morton, 12.  
 — *obscura* Morton, 14.  
 — *mexicana* Fritsch, 12.  
 — *saxicola* Morton, 14.  
*Achyroperum maculatus* var. *alpestris* Schur, 96.  
 — — var. *alpicola* Schur, 96.  
 — — var. *longifolius* G. Froel. ex Hegl, 96.  
 — — var. *microcephalus* DC., 97.  
 — — var. *monocephalus* DC., 97.  
 — — var. *oblongifolius* DC., 96.  
 — — var. *obtusifolius* Schur, 97.  
 — — var. *pinnatifidus* Uechtr., 96.  
 — — var. *ramosissimus* Schur, 97.  
*Achyroperum* in tropical Africa, 47.  
*Achyroperum aethiopicum* Welw., 59.  
 — *africanum* Hook. fil. ex Baker, 59.  
 — *axillare* E. A. Bruce, 56.  
 — *Carvalhi* Gürke, 55.  
 — *ciliatum* Gürke, 55.  
 — *cryptanthum* Baker, 58.  
 — *dasytrichum* Perk., 60.  
 — *densiflorum* Bl., 55.  
 — *erythrobotrys* Perk., 56.  
 — *laterale* Baker, 53.  
 — *Mearnsii* Standley, 59.  
 — *micranthum* Perk., 53.  
 — *Mildbraedii* Perk., 58.  
 — *nyasanum* Baker, 58.  
 — *oblongifolium* Baker, 55.  
 — *parviflorum* S. Moore, 58.  
 — *Peulhorum* E. A. Bruce, 59.  
 — *radicans* Gürke, 53.  
 — — var. *grandibracteatum* E. A. Bruce, 53.  
 — *Schimperi* Perk., 58, 59.  
 — *Schlechteri* Gürke, 53, 55.  
 — *serratum* E. A. Bruce, 58.  
 — *Swina* Perk., 58.  
*Adenocalymma Hintoni* Sandwith, 10.  
*Aerangis* Reichb. fil., 227.  
 — sect. *Eu-Aerangis* Schlechter, 227.  
 — sect. *Rangaeris* Schlechter, 227.  
*Aerangis brachyceras* Summerhayes, 228.  
*Aëranthus muscicola* Reichb. fil., 228.  
Africa, *Achyroperum* in tropical, 47.  
African grasses, notes on, 293, 500.  
 — orchids, 221.  
 — plants, tropical, 469.  
Agriculture, an outline of Malayan (review), 441.  
 — colloids in (review), 242.  
*Agropyron elongatum* P. Beauv., 16.  
*Agrostis bryophila* C. E. Hubbard, 309.  
 — *Burtii* C. E. Hubbard, 305.  
 — *congesta* C. E. Hubbard, 301.  
 — *depressa* Mez ex Pilger, 310.  
 — *dissitiflora* C. E. Hubbard, 307.  
 — *Friesiorum* C. E. Hubbard, 305.  
 — *gracilifolia* C. E. Hubbard, 307.  
 — *isopholis* C. E. Hubbard, 303.  
 — *leioclada* C. E. Hubbard, 306.  
 — *leptophylla* C. E. Hubbard, 308.  
 — *Pilgeriana* C. E. Hubbard, 302.  
 — *sclerophylla* C. E. Hubbard, 310.  
 — *sororia* C. E. Hubbard, 303.  
 — *tricholemma* C. E. Hubbard, 304.  
 — *Uhligii* C. E. Hubbard, 309.  
 — — var. *contracta* C. E. Hubbard, 310.  
 — *Whytei* C. E. Hubbard, 302.  
Airy-Shaw, H.K., 189.  
 — Notes on the genus *Schima* and on the classification of the Theaceae-Camellioidae, 496.  
*Allium paniculatum* Linn., 16.  
 — *stamineum* Boiss., 16.  
*Alseodaphne penduliflora* Gamble, 69.  
America, contributions to the flora of tropical, 1, 210, 346, 387.  
American ferns (review), 292.  
Amsterdam resolutions, 126.  
*Amyris bicolor* Willd. ex Schlecht., 354.  
 — *bipinnata* Sessé et Moc. ex DC., 355.  
 — *copallifera* Spreng., 357.  
 — *crenata* Willd., 362.  
 — *fagaroides* Spreng., 361.  
 — *jorullensis* Spreng., 368.  
 — *lanuginosa* Spreng., 368.  
 — *Linaloe* La Ll., 363.  
 — *Linanoe* La Ll., 363.

*Amyris penicillata* Spreng., 374.  
 — *rugosa* Willd. ex Schlecht., 368.  
 — *sylvatica* Sessé et Moc., 377.  
 — *Tecomaca* DC., 377.  
 — *ventricosa* La Ll., 362.  
*Ancylanthus rufescens* E. A. Bruce, 477.  
*Andrographis elongata* T. And., 274.  
*Angraecum aphyllum* Thouars, 233.  
 — *Chevalieri* Summerhayes, 230.  
 — *Dorotheae* Rendle, 228.  
 — *pyriforme* Summerhayes, 230.  
 — *rhypsalisodium* Reichb. fil., 228.  
 — *Wakefieldii* Rolfe, 232.  
*Anisotes dumosus* Milne-Redhead, 487.  
*Anthericum campestre* Engl., 489.  
 — *suffruticosum* Milne-Redhead, 489.  
*Anthistiria dissoluta* Nees ex Steud., 295.  
 Apples and pears (review), 242.  
 Appointments—  
   Airy-Shaw, H. K., 189.  
   Brooks, F. T., 336.  
   Cockayne, A. H., 392.  
   Hutchinson, J., 189.  
   Tempany, H. A., 240.  
   Thorns, F. W., 441.  
*Arenaria Teddii* Turrill, 100.  
*Ariopsis peltata* Nimmo, 275.  
*Arisaema attenuatum* E. Barnes et C. E. C. Fischer, 275.  
 — *Barnesii* C. E. C. Fischer, 277.  
 — *peltatum* C. E. C. Fischer, 277.  
 — *rhizomatum* C. E. C. Fischer, 283.  
 — — var. *nudum* C. E. C. Fischer, 285.  
 — — var. *viride* C. E. C. Fischer, 285.  
 — *speciosum* var. *truncatum* C. E. C. Fischer, 285.  
 — *Wattii* Hook. fil., 285.  
 — *Wightii* Schott, 278.  
*Artemisia scoparia* Waldst. et Kit., 99.  
*Arundinarias* from Yunnan, two new, 106.  
*Arundinaria acutissima* Keng, 106.  
 — *Forrestii* Keng, 106.  
*Arundinella Raddi*, 318, 319.  
 — *brasiliensis* Raddi, 319.  
 — *flammida* Trin., 321.  
 — *hispida* O. Kuntze, 319.  
*Arundinelleae*, the genera of the tribe, 317.  
 Assam, plants new to, 280.  
*Aster alpinus* var. *Flahaultii* Sennen, 99.

Atchley, S. C. (obit.), 336.  
*Athanasia calva* Hutch., 83.  
 — *Dregeana* var. *sessilis* Burt Davy, 83.  
 — *turbinata* Burt Davy, 84.  
*Auxopus kamerunensis* var. *grandiflora* Summerhayes, 222.  
*Avena festuciformis* Hochst., 335.  
 — *lachnantha* Hook. fil., 335.  
 — *Newtonii* Stapf, 334.  
 — *muriculata* Stapf, 335.  
 — *Rothii* Stapf, 335.  
*Avenastrum elongatum* Pilger, 335.  
 — — var. *Friesiorum* Pilger, 333.  
 — *flabellatum* A. Peter, 335.  
 — *lachnanthum* Pilger, 335.  
 — *Mannii* Pilger, 334.  
 — *quinquenerve* Stent et J. M. Rattray, 335.  
 — *rigidulum* Pilger, 335.  
 — *umbrosum* Pilger, 334.

#### B.

*Balanophora elongata* Bl., 505.  
 — *globosa* Jungh., 505.  
 — *Ungeriana* Val., 505.  
 Bamboo genera, *Dinochloa* and *Melocalamus*, the, 251.  
 Banana wax, 517.  
 Bean, W. J., 336.  
 Bibliography of soil science, fertilizers and general agronomy (review), 141.  
 Books—  
   All about the Soya bean, 340.  
   American ferns, 292.  
   Apples and pears, 242.  
   Bibliography of soil science, fertilizers and general agronomy, 141.  
   Botanical magazine, 192, 243, 336, 467.  
   Cherries and soft fruits, 291.  
   Chronica botanica, 395.  
   Climate and vegetation of the Koonamore Vegetation Reserve to 1931, on the, 288.  
   Colloids in agriculture, 242.  
   Cultivated crop plants of the British Empire and the Anglo-Egyptian Sudan, 240.  
   Dictionary of the economic products of the Malay Peninsula, a, 131.  
   Dictionnaire descriptif et synonymique des genres de plantes phanérogames, 142.  
   Everyday botany, 243.  
   Extra pharmacopoeia of Martindale and Westcott, the, 241.

## Books—

- Flora of Victoria, 338.  
 Flore Laurentienne, 133.  
 Forest flora of Southern Nigeria, 466.  
 Garden variety, 143.  
 Gentians, 289.  
 Genus *Eriogonum*, the, 443.  
 Handbook and guide to the herbarium collections in the public museums, Liverpool, 138.  
 Hooker's *Icones plantarum*, 139, 190.  
 Index of the minor forest products of the British Empire, an, 468.  
 Insect pests of glasshouse crops, 244.  
 Intermediate botany, 243.  
 Lily year-book No. 4, 144.  
 Living garden, the, 137.  
 London clay flora, the, 136.  
 Mushroom handbook, the, 467.  
 Outline of Malayan agriculture, an, 441.  
 Pageant of the spice islands, a, 442.  
 Pollen grains, 339.  
 Raspberries and kindred fruits, 291.  
 Rock garden plants, 189.  
 Scientific principles of plant protection, the, 444.  
 Structure and composition of foods, the, 337.  
 Toadstools and mushrooms and other larger fungi of South Australia, 141.  
 Trees and shrubs of Kenya Colony, 466.  
 Welsh timber trees, 290.  
 Borneo and other Malay islands, contributions to the flora of, 17.  
 Botanical conference, third imperial, 144.  
 Botanical magazine (review), 192, 243, 338, 467.  
 "Botanical miscellany," the dates of Hooker's, 85.  
 Bower, F. O., 107.  
*Brachiaria dictyoneura* Stapf, 297.  
 — *humidicola* Schweickhardt, 297.  
 — *Schoenfelderi* C. E. Hubbard et Schweickhardt, 323.  
 Bremekamp, C. E. B. On the systematic position of the genus *Dolianthus* C. H. Wright, 103.  
 Brimble, L. J. F. Everyday botany (review), 243.  
 — Intermediate botany (review), 243.

- British Guiana, notes on an expedition to the Rupununi district, 526.  
 — — the genus *Tovomita* in, 210.  
 Briton-Jones, H. R. (obit.), 530.  
*Bromus milanjanus* Rendle, 334.  
 Brooks, F. T., 336.  
*Brosimum Galactodendron* D. Don, 506.  
 Bruce, E. A. *Achyrosporum* in tropical Africa, 47.  
 Bryce, J. *Spartina Townsendii* and *S. brasiliensis* in warm countries, 21.  
 Bullock, A. A. Contributions to the flora of tropical America: xxvii Notes on the Mexican species of the genus *Bursera*, 346: xxviii Species novae vel minus cognitae mexicanae Hintonianae, 387.  
 Burkill, I. H. A dictionary of the economic products of the Malay Peninsula (review), 131.  
*Balsamodendrum Liebmannii* L. March., 364.  
*Bursera*, notes on the Mexican species of the genus, 346.  
*Bursera acutidens* Sprague et Riley, 560.  
 — *Aloëxylon* Engl., 363.  
 — *aptera* Ramirez, 361.  
 — *arborea* Bullock, 353.  
 — *arida* Standl., 353.  
 — *aspleniifolia* T. S. Brandeg., 353.  
 — *bicolor* Engl., 354.  
 — *biflora* Standl., 354.  
 — *bipinnata* Engl., 355.  
 — *cerasifolia* T. S. Brandeg., 356.  
 — *cinerea* Engl., 364.  
 — *collina* T. S. Brandeg., 356.  
 — *concinna* Sandwith, 370.  
 — *confusa* Bullock, 356.  
 — *copallifera* Bullock, 357.  
 — *coryucensis* Bullock, 358.  
 — *cuneata* Engl., 368.  
 — *Delpechiana* Poiss. ex Engl., 374.  
 — *diversifolia* Rose, 359.  
 — *elemifera* Baill., 359.  
 — *excelsa* Engl., 360.  
 — *fagaroides* Engl., 361.  
 — *filicifolia* T. S. Brandeg., 363.  
 — *fragilis* S. Wats., 369.  
 — *Galeottiana* Engl., 363.  
 — *glabrescens* Rose, 368.  
 — *glabrifolia* Engl., 363.  
 — *gracilis* Engl., 355.  
 — *grandifolia* Engl., 364.



*Bursera graveolens* var. *pilosa* Engl., 382.  
 — *gummifera* var. *pubescens* Engl., 381.  
 — *heterophylla* Engl., 365.  
 — *Hindsiana* Engl., 366.  
 — — var. *rhoifolia* Engl., 366.  
 — *Hintoni* Bullock, 366.  
 — *Jonesii* Rose, 375.  
 — *lorullensis* Engl., 368.  
 — *Karwinskii* Engl., 369.  
 — *Kerberi* Engl., 377.  
 — *lancifolia* Engl., 369.  
 — *lanuginosa* Engl., 368.  
 — *laxiflora* S. Wats., 370.  
 — *lonchophylla* Sprague et Riley, 357.  
 — *longipedunculata* Standl., 371.  
 — *longipes* Standl., 371.  
 — *mexicana* Engl., 359, 374.  
 — *microphylla* A. Gray, 371.  
 — *morelensis* Ramirez, 371.  
 — *multijuga* Engl., 372.  
 — *Nelsoni* Rose, 364.  
 — *nesopola* I. M. Johnst., 366.  
 — *obovata* Turcz., 361.  
 — *occidentalis* Riley, 365.  
 — *odorata* T. S. Brandeg., 362.  
 — *ovalifolia* Engl., 373.  
 — *Palmeri* S. Wats., 360.  
 — — var. *glabrescens* S. Wats., 368.  
 — *pannosa* L. March. ex Engl., 375.  
 — *penicillata* Engl., 374.  
 — *Pringlei* S. Wats., 372.  
 — *pubescens* S. Wats., 382.  
 — *Purpusii* T. S. Brandeg., 361.  
 — *queretarensis* Standl., 360.  
 — *rhoifolia* I. M. Johnst., 366.  
 — *rubra* Riley, 375.  
 — *Schaffneri* S. Wats., 361.  
 — *Schiedeana* Engl., 363, 364.  
 — *Schlechtendalii* Engl., 375.  
 — *sessiliflora* Engl., 375.  
 — *sphaerocarpa* Sprague et Riley, 360.  
 — *stenophylla* Sprague et Riley, 376.  
 — *submoniliformis* Engl., 376.  
 — *subtrifoliata* Standl., 377.  
 — *tenuifolia* Rose, 366.  
 — — Engl. ex O. Kuntze, 359.  
 — *trifoliolata* Bullock, 378.  
 — *trijuga* Ramirez, 370.  
 — *trimera* Bullock, 369.  
 — *velutina* Bullock, 380.

Burt, B. L. A note on the Himalayan Daphnes, 433.  
 — Melanesian plants, 459.  
 Butcher, F. H., 336.  
*Byttneria atrata* Bullock, 1.  
 C.  
*Callilepis lancifolia* Burt Davy, 84.  
*Caloncoba echinata* Gilg, 341.  
 Cambridge, the professorship of botany at, 336.  
 Camelloideae, the classification of the, 498.  
 Cameroons Mountain, a new genus from the, 300.  
*Campanula rosmarinifolia* Kerr, 35.  
*Canarium Endertii* H. J. Lam, 17.  
 Candelilla wax, 512.  
 Cane wax, 523.  
*Canthium cymigerum* B. L. Burt, 463.  
 — *dyscriton* Bullock, 478.  
 Carnauba wax, 509.  
 Carr, C. E. (obit.), 531.  
*Cassia Hintoni* Sandwith, 5.  
 — *trichocraspedon* Sandwith, 6.  
*Castanopsis lentiginosa* E. F. Warburg, 20.  
 Centenary of the Botanical Society of Edinburgh, 394.  
 — of the University of London, 393.  
*Ceropegia Stentiae* E. A. Bruce, 490.  
 — *turricula* E. A. Bruce, 491.  
*Ceroxylon andicola* H. et B., 506.  
 Chandler, M. F. J. and Reid, E. M.  
 The London clay flora (review), 136.  
 Chaulmoogra oil, 341.  
 Cherries and soft fruits (review), 291.  
 Chittenden, F. J. Cherries and soft fruits (review), 291.  
*Chlorophytum rhizomatosum* Bak., 489.  
 — *suffruticosum* Bak., 489.  
 Chronica botanica (review), 395.  
*Chrysanthemum lasiopodium* Hutch., 84.  
*Cineraria Burkei* Burt Davy, 80.  
 — *parvifolia* Burt Davy, 81.  
*Cinnamomum iners* Reinw., 69.  
 — *inunctum* Meissn., 68.  
 — *parthenoxylon* Meissn., 67, 68.  
*Clausena Hildebrandtii* Engl., 475.  
*Clausenopsis Hildebrandtii* Milne-Redhead, 475.  
 Clay, G. F., 336.  
 Clay flora, the London (review), 136.

Cleland, J. B. Toadstools and mushrooms and other larger fungi of South Australia (review), 141.  
 Clemens, J. (obit.), 287.  
*Cleome mexicana* Hemsl., 388.  
*Cleomella Hemsleyana* Bullock, 388.  
*Cleyera integrifolia* Planch. ex Choisy, 391.  
 — *Mertensiana* Sieb. et Zucc., 498.  
 — *syphilitica* Choisy, 391.  
 Cloves (review), 442.  
 Cockayne, A. H., 392.  
*Cocos nucifera* Linn., 508.  
 Colloids in agriculture (review), 242.  
 Conference, third imperial botanical, 144.  
 Congress at Amsterdam, 1935, resolutions of the sixth international botanical, 126.  
 Cooper, N. L. (obit.), 109.  
*Copernicia cerifera* Mart., 509.  
*Craibiodendron shanicum* W. W. Sm., 498.  
 — *stellatum* W. W. Sm., 498.  
 Crofton, R. H. 'A pageant of the spice islands' (review), 442.  
 Crop plants, cultivated (review), 240.  
 Cultivated crop plants (review), 240.  
*Cunonia celebica* Bl., 462.  
*Cymbopogon Dieterlenii* Stapf ex Schweickerdt, 325.  
 Cyprus, additions to the flora of, 16.  
*Cyrtandra filibracteata* B. L. Burtt, 463.  
*Cyrtandropsis* Lauterbach, 464.  
*Cytisus sericeus* Willd., 245.

D.

*Daedalacanthus* T. Anders., 255.  
*Dalbergia stricta* Bojer, 245.  
*Dalea Hintoni* Sandwith, 2.  
 Dallimore, W. (ret.), 189.  
*Danthonia Davy* C. E. Hubbard, 501.  
 — *elongata* Hochst. ex A. Rich., 335.  
 — *Kostlinii* Hochst. ex A. Rich., 330.  
 — *nutans* Steud., 330.  
*Danthoniopsis* Stapf, 318, 319.  
 — *Gossweilerii* Stapf, 319.  
 — *intermedia* C. E. Hubbard, 500.  
 — *viridis* C. E. Hubbard, 319.  
*Daphnes*, a note on the Himalayan, 433.  
*Daphne Bholua* Ham. ex D. Don, 434, 435, 437.  
 — var. *glacialis* B. L. Burtt, 438.  
 — *cannabina* Lour., 434, 437, 439.

"*Daphne cannabina* Wall.", 433-440  
 — var. *Bholua* Keissler, 436, 438.  
 — var. *glacialis* W. W. Smith et Cave, 436, 438.  
 — var. *latifolia* Keissler, 435, 436.  
 — var. *parvifolia* Keissler, 435, 436.  
 — *papyracea* Wall. ex Steud., 435, 436, 437, 439.  
 — var. *latifolia* Meisn., 435, 436.  
 — var. *parvifolia* Meisn., 435, 436.  
 — *odora* Thunb., 434, 435, 439.  
 — *sureil* W. W. Smith et Cave, 435, 436.  
*Dasystachys polyphylla* Bak., 489.  
 Davis, T. A. W. Notes on an expedition to the Rupununi district, British Guiana, 526.  
 Davy, J. Burt and Hutchinson, J. New or noteworthy South African plants: viii. New Compositae from the Transvaal, 80.  
*Dehaasia cuneata* Bl., 70.  
 — *Curtisii* Gamble, 70.  
 Deighton, F. C. List of fungi collected in Sierra Leone, 424.  
 — Preliminary list of fungi and diseases of plants in Sierra Leone, 397.  
*Delphinium bicornutum* Hemsl., 387.  
 — var. *Hemsleyi* Huth, 387.  
*Dendrobium roseum* Sw., 223.  
*Desmodium longibracteatum* Schindler, 280.  
 — *rufihirsutum* Craib, 280.  
 Diatomaceae available on loan, works on, 110.  
 Dictionary of the economic products of the Malay Peninsula, a (review), 131.  
 — of phanerogamic genera (review), 142.  
*Dignathia villosa* C. E. Hubbard, 293.  
*Diheteropogon maximus* C. E. Hubbard, 296.  
 Dinochloa and Melocalamus, the bamboo genera, 251.  
*Dinochloa* Büse, 251.  
 — *compactiflora* McClure, 253.  
 — *scandens* O. Kuntze, 252.  
*Dioscorea Garrettii* Prain et Burkill, 493.  
 — *hainanensis* Prain et Burkill, 494.

*Dioscorea Scortechinii* var. *parviflora*  
Prain et Burkill, 495.  
*Dioscorides*, technical terms in Ruel-  
lius', 145.  
*Diplachne biflora* Hack., 335.  
*Diplycosia epiphytica* Fletcher, 40.  
*Disa subaequalis* Summerhayes, 221.  
*Disciphania mexicana* Bullock, 388.  
Diseases of economic plants in Tan-  
ganyika Territory, second list of  
fungi and, 234.  
— of plants, preliminary list of fungi  
and, 397.  
*Dolianthus* C. H. Wright, on the  
systematic position of the genus,  
103.  
*Dolianthus vaccinioides* C. H. Wright,  
105.  
*Dovyalis xanthocarpa* Bullock, 469.  
*Draba cuzcoënsis* O. E. Schulz, 490.  
*Drymaria grandis* Bullock, 389.  
*Duvernoia salviflora* Lindau, 488.

#### E.

*Echinochloa ugandensis* C. E. Hub-  
bard et Snowden, 315.  
*Echium glomeratum* Poir., 16.  
Edmunds, H. R., 336.  
*Elaphrium acuminatum* Rose, 373.  
— *Aloëxylon* Schiede ex Schlechtd.,  
363.  
— *apterum* Rose, 361.  
— *arboreum* Rose, 353.  
— *aridum* Rose, 353.  
— *ariense* H.B.K., 382.  
— *aspleniifolium* Rose, 353.  
— *attenuatum* Rose, 382.  
— *bicolor* Willd. ex Schlechtd.,  
354.  
— *biflorum* Rose, 354.  
— *bipinnatum* Schlechtd., 355.  
— *brachypodum* Rose, 375.  
— *cerasifolium* Rose, 356.  
— *cinereum* Rose, 365.  
— *collinum* Rose, 356.  
— *confusum* Rose, 356.  
— *copalliferum* Sessé et Moc. ex  
DC., 357.  
— *Covillei* Rose, 362.  
— *cuneatum* Schlechtd., 368.  
— *Delpechianum* Rose, 374.  
— *diversifolium* Rose, 359.  
— *elemiferum* Royle, 359.  
— *epinnatum* Rose, 366.  
— *excelsum* H.B.K., 360.  
— *fagaroides* H.B.K., 361.  
— *filicifolium* Rose, 363.  
— *fragile* Rose, 370.  
— *Galeottianum* Rose, 363.

*Elaphrium glabrescens* Rose, 368.  
— *glabrifolium* H.B.K., 363.  
— *Goldmani* Rose, 366.  
— *gracile* Rose, 355.  
— *grandifolium* Schlechtd., 364.  
— *heterophyllum* Rose, 365.  
— *Hindsianum* Benth., 366.  
— *Jonesii* Rose, 375.  
— *jevullense* H.B.K., 368.  
— *Karwinskii* Rose, 369.  
— *Kerberi* Rose, 377.  
— *lancifolium* Schlechtd., 369.  
— *lanuginosum* H.B.K., 368.  
— *laxiflorum* Rose, 370.  
— *longipedunculatum* Rose, 371.  
— *longipes* Rose, 371.  
— *MacDougallii* Rose, 366.  
— *mexicanum* Rose, 374.  
— *microphyllum* Rose, 371.  
— *morelense* Rose, 371.  
— *multifolium* Rose, 371.  
— *multijugum* Rose, 372.  
— *Nelsoni* Rose, 364.  
— *obovatum* Rose, 361.  
— *occidentale* Rose, 365.  
— *odoratum* Rose, 357, 362, 375.  
— *ovalifolium* Schlechtd., 373.  
— *Palmeri* Rose, 360.  
— *pannosum* Rose, 375.  
— *penicillatum* Sessé et Moc. ex  
DC., 374, 382.  
— *pilosum* Rose, 382.  
— *Pringlei* Rose, 372.  
— *pubescens* Schlechtd., 382.  
— *Purpusii* Rose, 361.  
— *queretarensis* Rose, 360.  
— *rhoifolium* Benth., 366.  
— *rubrum* Rose, 375.  
— *Schaffneri* Rose, 361.  
— *Schiedeanum* Rose, 364.  
— *sessiliflorum* Rose, 353, 375.  
— *Simaruba* Rose, 353, 373.  
— *simplicifolium* Schlechtd., 375.  
— *subpubescens* Rose, 381.  
— *submoniliforme* Rose, 377.  
— *subtrifoliatum* Rose, 377.  
— *Tecomaca* Standl., 370, 377.  
— *tenuifolium* Rose, 357.  
— *trijugum* Rose, 370.  
Elliot, C. Rock garden plants (re-  
view), 189.  
*Elsholtzia Schimperii* Hochst. ex Briq.,  
59.  
*Embelia calcarea* Fletcher, 44.  
— *disticha* Fletcher, 45.  
— *grandifolia* Fletcher, 45.  
— *impressa* Fletcher, 46.  
— var. *serrata* Fletcher, 46.

*Embelia Kerrii* Fletcher, 46.  
 Empire minor forest products (review), 468.  
*Epilobium hirsutum* var. *villosissimum* Koch, 99.  
 Epling, C. Note on the distribution of Hyptis in the Old World, 278.  
*Eragrostis Barteri* C. E. Hubbard, 311.  
 — *chalarothyrsos* C. E. Hubbard, 310.  
 — *Glanvillei* C. E. Hubbard, 312.  
 — *Pobeguini* C. E. Hubbard, 312.  
 Eranthemum of the "Flora of tropical Africa," 255.  
*Eranthemum* Linn., 255.  
 — *affine* Spreng., 272.  
 — *ardisioides* C. B. Clarke, 263.  
 — *atropurpureum* Bull., 274.  
 — *bilabiale* C. B. Clarke, 263.  
 — *decurrens* Hochst. ex Nees, 269.  
 — *Hildebrandtii* C. B. Clarke, 260.  
 — *hypocrateriforme* Roem. et Schultes, 267, 270, 273.  
 — *Ludovicianum* Büttn., 263.  
 — *nigritianum* T. Anders., 264.  
 — *plumbaginoides* P. Maury, 273.  
 — *senense* Klotzsch, 269.  
 — *seticalyx* C. B. Clarke, 270.  
 — *subviscosum* C. B. Clarke, 263.  
 Eriogonum, the genus (review), 443.  
 Esparto wax, 524.  
*Eulophia* R. Br., 222.  
 — *Barteri* Summerhayes, 224.  
 — *caricifolia* Summerhayes, 225.  
 — *Horsfallii* Summerhayes, 223.  
 — *involuta* Summerhayes, 225.  
 — *latilabris* Summerhayes, 223.  
 — *Millsoni* Summerhayes, 225.  
 — *nuda* Lindl., 275.  
 — *oedoplectron* Summerhayes, 223.  
 — *tuberifera* Kraenzl., 225.  
*Euphorbia antisiphilitica* Lucc., 514.  
 — *cerifera* Alc., 512.  
 — *cernua* Coss. et Dur., 103.  
 — *stenoclada* Baill., 515.  
 — *xylophyloides* Brongn., 515.  
*Euphrasia Willkommii* Freyn, 100.  
*Eurya Benthamiana* Bullock, 391.  
 — *Hintoni* Bullock, 391.  
 — *integrifolia* Szyszyl., 391.  
 — *mexicana* Szyszyl., 391.  
 — *siphilitica* Szyszyl., 391.  
 Everyday botany (review), 243.  
 Ewart, A. J. Flora of Victoria (review), 338.  
 Extra pharmacopoeia of Martindale and Westcott, the (review), 241.

## F.

*Fagaropsis Hildebrandtii* Milne-Redhead, 475.  
 Fauna and flora of the Royal Botanic Gardens, Kew, additions to the wild, 60.  
 Fibre wax, 524.  
*Ficus variegata* Bl., 515.  
 — *Wardii* C. E. C. Fischer, 281.  
 — *Xiphias* C. E. C. Fischer, 282.  
*Finschia Waterhousiana* B. L. Burt., 465.  
 Fischer, C. E. C. Plants new to Assam, 280.  
 Fish poison, Mundulea, 245.  
 Flax wax, 516.  
 Flora of Borneo and other Malay islands, contributions to the, 17.  
 — of Cyprus, additions to the, 16.  
 — of Siam, contributions to the, 34.  
 — of the Nearer East, on the, 100.  
 — of the Pyrénées Orientales, the. New varieties and additions, 95.  
 — of the Royal Botanic Gardens, Kew, additions to the wild fauna and, 60.  
 — of tropical America, contributions to the, 1, 210, 346, 387.  
 — the London clay (review), 136.  
 — of Victoria (review), 338.  
 Flore Laurentienne (review), 133.  
 Fog, damage to plants by, 553.  
 Foods, the structure and composition of (review), 337.  
 Forest flora of Southern Nigeria (review), 466.  
 — products, empire minor (review), 468.  
*Freziera integrifolia* Benth., 391.  
 Frost of May 16th, 1935, the effects of the, 72.  
 Fruits and vegetables (review), 337.  
 Fungi and diseases of economic plants in Tanganyika Territory, second list of, 234.  
 — and diseases of plants in Sierra Leone, preliminary list of, 397.  
 — collected in Sierra Leone, list of, 424.  
 — of South Australia (review), 141.

## G.

*Garcinia scaphopetala* B. L. Burt., 459.  
 Gardens (report), 534.  
 Garden, the living (review), 137.

Garden variety (review), 143.  
 Genera, dictionary of phanerogamic (review), 142.  
 — of the tribe Arundinelleae, the, 317.  
 Gentians (review), 289.  
*Gilgichloa* Pilger, 318, 322.  
 — *indurata* Pilger, 322.  
*Gloxinia antirrhina* DC., 11.  
*Glyceria ramigera* F. Muell., 525.  
 Godang wax, 515.  
*Gordonia Lasianthus* Ellis, 496.  
 — *sinensis* Hemsl. et Wils., 496.  
 Grasses, notes on African, 293, 500.  
 Gray, G. D. All about the Soya bean (review), 340.  
 Greenway, P. J. *Mundulea* fish poison, 245.  
*Grewia filiformis* Bullock, 471.  
 Grist, D. H. An outline of Malayan agriculture (review), 441.

#### H.

*Hardwickia binata* Roxb., 461.  
 — *pinnata* Roxb., 461.  
 Havelock, E. H. F., 336.  
*Hedychium Wardii* C. E. C. Fischer, 283.  
*Helictotrichon angustum* C. E. Hubbard, 330.  
 — *cartilagineum* C. E. Hubbard, 331.  
 — *elongatum* C. E. Hubbard, 335.  
 — *Friesiorum* C. E. Hubbard, 333.  
 — *lachnanthum* C. E. Hubbard, 335.  
 — *Maillandii* C. E. Hubbard, 332.  
 — *Mannii* C. E. Hubbard, 334.  
 — *milanjianum* C. E. Hubbard, 334.  
 — *Newtonii* C. E. Hubbard, 334.  
 — *phaneroneuron* C. E. Hubbard, 332.  
 — *rigidulum* C. E. Hubbard, 335.  
 — *Thomasii* C. E. Hubbard, 500.  
 — *umbrosum* C. E. Hubbard, 334.  
 — var. *micrantherum* C. E. Hubbard, 334.

Herbarium (report), 555.

*Hibiscus canescens* Heyne, 274.

*Hieracium Pilosella* subsp. *velutinum* Heg. et Her., 99.

— *umbellatum* subsp. *serotinum* Host, 99.

Himalayan Daphnes, a note on the, 433.

Hitchcock, A. S. (obit.), 107.

*Holosteum macropetalum* Hausskn. et Bornm., 101.

*Holosteum praeumbellatum* Candargy, 101.

— *tenerrimum* Boiss., 101.

— *umbellatum* var. *tenerrimum* Gay, 101.

*Homoseugos Eylestii* C. E. Hubbard, 295.

Hooker's "Botanical miscellany," the dates of, 85.

— *Icones plantarum* (review), 139, 190.

Hort, A. Garden variety (review), 143.

Hortus Bergianus, 502.

Horwood, A. R. The flora of the Pyrénées Orientales. New varieties and additions, 95.

Howes, F. N. Sources of vegetable wax, 503.

Hubbard, C. E. Notes on African grasses, 293, 500.

— The genera of the tribe Arundinelleae, 317.

Hutchinson, J., 107, 189, 286.

— and Davy, J. Burt. New or noteworthy South African plants: viii. New Compositae from the Transvaal, 80.

Hyde, H. A. Welsh timber trees (review), 290.

Hydnocarpus Wightianus in Nigeria, the cultivation of, 341, 532.

*Hydnocarpus anthelminticus* Pierre, 341.

— *Wightianus* Blume, 341, 532.

*Hyparrhenia dissoluta* C. E. Hubbard ex Hutch., 295.

— *Ruprechtii* Fourn., 295.

*Hypericum elegantissimum* Crantz, 98.

— *fastigiatum* H.B.K., 389.

— *Hintoni* Bullock, 390.

— *montanum* Linn., 98.

— — var. *caucasicum* Parl., 98.

— — var. *maculantherum* Sagorski, 98.

— — var. *pilosum* Horw., 98.

— — var. *scaberulum* Beck, 98.

— — var. *scabrum* Koch, 98.

— — var. *triphyllum* DC., 98.

— — var. *typica* Beck, 98.

— — — forma *abbreviata* Reinecke, 98.

— *Spragueanum* Bullock, 389.

*Hypochoeris illyrica* K. Maly, 96.

— *macedonica* Form., 96.

— *maculata* Linn., 96.

— — subsp. *Pelivanovicii* Hayek, 96.

*Hypochoeris maculata* var. *alpestris* Horw., 96.  
 ——— var. *alpicola* Horw., 96.  
 ——— var. *citrina* K. Maly, 97.  
 ——— var. *fallax* Murr. ex Hegi, 97.  
 ——— var. *illyrica* Hayek, 96.  
 ——— var. *koritnicensis* Dörf. et Hayek, 96.  
 ——— var. *microcephala* Horw., 97.  
 ——— var. *Muelleri* Lange, 98.  
 ——— var. *oblongifolia* K. Maly, 96.  
 ——— var. *obtusifolia* Horw., 97.  
 ——— var. *Pelivanovicii* Horw., 96.  
 ——— var. *phyllocaulos* Metsch., 96.  
 ——— var. *pinnatifida* Weiss, 96.  
 ——— var. *ramosissima* Horw., 97.  
 ——— var. *runcinata* Horw., 97.  
 ——— var. *simplex* Duby, 97.  
 ——— var. *uniflora* DC., 97.  
 ——— forma *monocephala* Fiori, 97.  
 ——— forma *tirolensis* Fiori, 96.  
 ——— *Pelivanovicii* Petrov. ex Velen., 96.  
 ——— var. *illyrica* K. Maly, 96.  
 ——— var. *typica* K. Maly, 96.  
 ——— *tyrolensis* Schiw. ex DC., 96.  
*Hypseochoa* C. E. Hubbard, 300.  
 ——— *cameroonensis* C. E. Hubbard, 299, 300.  
*Hyptis* in the Old World note on the distribution of, 278.  
*Hyptis americana* Urban, 278.  
 ——— *atrorubens* var. *africana* Epling, 279.  
 ——— *brevipes* Poit., 279.  
 ——— *capitata* var. *mexicana* Briq., 279.  
 ——— *conferta* var. *angustifolia* Benth., 279.  
 ——— *decurrens* Epling, 279.  
 ——— *lanceifolia* Schum., 280.  
 ——— *lanceolata* Poir., 279.  
 ——— *marianthorum* Briq., 279.  
 ——— *pectinata* Poit., 278.  
 ——— *rhomboidea* M. et G., 279.  
 ——— *spicigera* Lam., 278.  
 ——— *suaveolens* Poit., 278.

# I.

Icones plantarum, Hooker's (review), 139, 190.

Imperial botanical conference, third, 144.  
 Index kewensis (report), 676.  
 India, new or little known plants from south, 274.  
*Indigofera annua* Milne-Redhead, 470.  
 ——— *shinyangensis* Milne-Redhead 471.  
 ——— *tenuis* Milne-Redhead 472.  
 Insect pests of glasshouse crops (review), 244.  
 Intermediate botany (review), 243.  
*Ixora ulugurensis* Brem., 479.

# J.

Jackson, A. K. Additions to the flora of Cyprus, 16.  
 Japan wax, 522.  
 Jay, B. A. The anatomy of some lauraceous scent-yielding woods known as "Medang," 66.  
 Jodrell laboratory (report), 552.  
*Justicia hypocrateriformis* Vahl, 270.  
 ——— *salviiflora* C. B. Clarke, 488.  
 ——— *salvioides* Milne-Redhead, 488.  
 ——— *tunicata* Afzel., 264.

# K.

*Kadsura ananosma* Kerr, 34.  
 Keng, Y. L. Two new Arundinarias from Yunnan, 106.  
 Kennedy, J. D. Forest flora of Southern Nigeria (review), 466.  
 ——— The cultivation of *Hydnocarpus Wightianus* in Nigeria, 341.  
 Kenya Colony, trees and shrubs of (review), 466.  
 Kew, additions to the wild fauna and flora of the Royal Botanic Gardens, 60.  
*Kingiodendron* Harms, 461.  
 ——— *alternifolium* Merrill et Rolfe, 361.  
 ——— *micranthum* B. L. Burtt, 460.  
 ——— *platycarpum* B. L. Burtt, 460.  
 Kirstenbosch, the curatorship of, 441.  
*Knautia purpurea* Vill., 99.  
*Kniphofia Rogersii* E. A. Bruce, 488.  
*Koeleria cristata* var. *shivensis* C. E. Hubbard, 500.  
*Kohleria saxicola* Brandege, 14.  
 Koonamore Vegetation Reserve to 1931, on the climate and vegetation of the (review), 288.  
*Koordersiochloa* Merrill, 330.  
 Krieger, L. C. C. The mushroom handbook (review), 467.

L.

- Lactuca dubia* Jord., 99.  
 — *Scariola* Linn., 99.  
*Lamium maculatum* var. *rugosum* Briq., 100.  
*Langsdorffia hypogaea* Mart., 516.  
*Lankasteria* Lindl., 255.  
*Lasianthus cereiflorus* E. A. Bruce, 480.  
 — *pedunculatus* E. A. Bruce, 480.  
 — *Wallacei* E. A. Bruce, 481.  
 Lauraceous scent-yielding woods known as "Medang," the anatomy of some, 66.  
 Laurentienne, flore (review), 133.  
*Lavandula officinalis* var. *pyrenaica* Benth., 100.  
 Lawrence, J. R. and Roberts, E. A. American ferns (review), 292.  
*Leersia triandra* C. E. Hubbard, 313.  
 Lemée, A. Dictionnaire descriptif et synonymique des genres de plantes phanérogames (review), 142.  
 Library (report), 579.  
 Lily year-book (review), 144.  
*Linaria alpina* var. *unicolor* Gremli, 99.  
*Linnaeopsis gracilis* E. A. Bruce, 486.  
*Linum usitatissimum* Linn., 516.  
*Lissochilus* R. Br., 222.  
 — *Andersoni* Rolfe, 225.  
 — *elatus* Rolfe, 223.  
 — *caricifolius* Reichb. fil., 225.  
 — *Horsfallii* Batem., 223.  
 — *Johnsoni* Rolfe, 225.  
 — *lacteus* Kraenzl., 225.  
 — *longifolius* Benth., 225.  
 — *macranthus* Lindl., 223.  
 — *Millsoni* Rolfe, 225.  
 — *roseus* Lindl., 223.  
 — *Schweinfurthii* Reichb. fil., 223.  
 — *Smithii* Rolfe, 225.  
*Lithocarpus sarawakensis* E. F. Warburg, 19.  
 — *sericobalanos* E. F. Warburg, 20.  
*Litsea castanea* Hook. fil., 71.  
 — *megacarpa* Gamble, 71.  
 — *myristicifolia* Wall. ex Hook. fil., 71.  
 — *tomentosa* Bl., 71.  
*Littonia rigidifolia* Bredell, 495.  
 Liverpool, handbook and guide to the herbarium collections in the public museums (review), 138.  
 Living garden, the (review), 137.  
*Lobelia leucanthera* Kerr, 34.  
 — *palustris* Kerr, 35.  
*Lonchocarpus Hintoni* Sandwith, 4.

- London clay flora, the (review), 136.  
*Loranthus Gomesii* E. A. Bruce, 474.  
 — *meridianus* E. A. Bruce, 475.  
 — *Ngurukizi* E. A. Bruce, 475.  
*Loudetia* Hochst. ex Steud., 318, 319.  
 — sect. *Eu-Loudetia* C. E. Hubbard, 320, 321.  
 — — — — — subsect. *Acuminatae* C. E. Hubbard, 320, 321.  
 — — — — — *Annuae* C. E. Hubbard, 320, 321.  
 — — — — — *Densispicae* C. E. Hubbard, 320, 321.  
 — — — — — *Flammidae* C. E. Hubbard, 320, 321.  
 — — — — — *Pungentes* C. E. Hubbard, 320, 321.  
 — — — — — *Typicae* C. E. Hubbard, 320, 321.  
 — — *Lophanthera* C. E. Hubbard, 321.  
 — — *Paratristachya* C. E. Hubbard, 320, 321.  
 — — *Pleioneura* C. E. Hubbard, 320, 321.  
 — — *Pseudotristachya* C. E. Hubbard, 320, 321.  
 — *acuminata* C. E. Hubbard, 321.  
 — *anomala* C. E. Hubbard et Schweickerdt, 324.  
 — *Demeusei* C. E. Hubbard, 321.  
 — *densispica* C. E. Hubbard, 321.  
 — *elegans* Hochst., 319, 321.  
 — *flammida* C. E. Hubbard, 321.  
 — *hordeiformis* C. E. Hubbard, 321.  
 — *ramosa* C. E. Hubbard, 321, 324.  
 — *simplex* C. E. Hubbard, 321.  
 — *superba* De Not., 319, 321.  
 — *ternata* C. E. Hubbard, 321.  
 — *togoënsis* C. E. Hubbard, 321.  
*Lysiloma cuernavacana* Britton et Rose, 8.  
*Lysimachia Garretii* Fletcher, 41.  
 — *oppositifolia* Fletcher, 41.  
 — *pilosa* Fletcher, 42.

M.

- Macfarlane, J. M., 107.  
*Madhuca Korthalsii* var. *typica* H. J. Lam, 19.  
*Maesa crenata* Fletcher, 42.  
 — *lineolata* Fletcher, 43.  
 — *paniculata* var. *pauciflora* Fletcher, 43.  
 — *sublanceolata* Fletcher, 43.  
 Mahoganies, a list of true and false, 193.  
 Malayan agriculture, an outline of (review), 441.

Malay Peninsula, a dictionary of the economic products of the (review), 131.

*Marialvaea macrophylla* Poepp. et Endl., 219.

Marie-Victorin, Frère. Flore Laurentienne (review), 133.

Markham, E. Raspberries and kindred fruits (review), 291.

Marsden-Jones, E. M. and Turrill, W. B. Researches on *Silene maritima* and *S. vulgaris*: xvi. The results of further interspecific crossing, 445.

Marshall, C. E. Colloids in agriculture (review), 242.

Marshall, H. S. The dates of Hooker's "Botanical miscellany," 85.

Martin, H. The scientific principles of plant protection (review), 444.

Mathews, J. W., 441.

Matthew, C. G. (obit.), 189.

McClure, F. A. The bamboo genera *Dinochloa* and *Melocalamus*, 251. "Medang," the anatomy of some lauraceous scent-yielding woods known as, 66.

*Medicago ciliaris* Krock., 16.

Melanesian plants, 459.

*Melocalamus*, the bamboo genera *Dinochloa* and, 251.

*Melocalamus* Benth., 251.

— *compactiflorus* Benth., 253.

Melville, R. A list of true and false mahoganies, 193.

*Mercurialis leiocarpa* Sieb. et Zucc., 281.

Mexican species of the genus *Bursera*, notes on the, 346.

*Micranthera clusioides* Choisy, 220.

*Microcoelia aphylla* Summerhayes, 233.

— *microglossa* Summerhayes, 231.

Miles, H. W. and M. Insect pests of glasshouse crops (review), 244.

Milne-Redhead, E. *Eranthemum* of the "Flora of tropical Africa," 255.

*Mimosa egregia* Sandwith, 7.

*Monocymbium lanceolatum* C. E. Hubbard, 313.

*Mundulea* fish poison, 245.

*Mundulea sericea* Greenway, 245.

— *striata* Baill., 245.

— *suberosa* Benth., 245.

*Musa malaccensis* Ridl., 517.

— *zebrina* van Houtte, 517.

Museums (report), 550.

Mushroom handbook, the (review), 467.

*Myrica carolinensis* Mill., 520.

— *cerifera* Linn., 519.

— *cordifolia* Linn., 519.

— *mexicana* Willd., 520.

— *Pringlei* Greenm., 520.

— *xalapensis* H.B.K., 520.

Myrtle wax, 518.

*Mystacidium longicaudatum* Rolfe, 228.

## N.

Nearer East, on the flora of the, 100.

*Nervilia Afzelii* var. *grandiflora* Summerhayes, 222.

Nigeria, the cultivation of *Hydnocarpus Wightianus* in, 341, 532.

*Niphaea cupreo-virens* Lem., 15.

— *mexicana* Morton, 15.

Nomenclature (report), 574.

— note on typification, 441.

— principal decisions concerning, made by the sixth international botanical congress, 185.

Notes on African grasses, 293, 500.

*Nothaphoebe panduriformis* Gamble, 72.

## O.

Obituary notices—

Atchley, S. C., 336.

Britton-Jones, H. R., 530.

Carr, C. E., 531.

Clemens, J., 287.

Cooper, N. L., 109.

Hitchcock, A. S., 107.

Matthew, C. G., 189.

Phillips, L., 392.

Rodway, L., 287, 502.

Shaw, F. J. F., 393.

Silva Tarouca, Count, 501.

Wakehurst, Lord, 286.

*Ocimum Peulhorum* A. Chev., 59.

— *sassandrae* A. Chev., 55.

*Onopordon Gautieri* Rouy, 99.

*Ophioglossum lusitanicum* Linn., 278.

Orchids, African, 221.

*Orthostichopsis tetragona* Hedw. Broth., errata slip opp. 145 (see K.B. 1934, 317.)

*Orysidium* C. E. Hubbard et Schweickerd, 326.

— *Barnardii* C. E. Hubbard et Schweickerd, 327, 328.

Osborn, T. G. B. and Paltridge, T. B. On the climate and vegetation of the Koonamore Vegetation Reserve to 1931 (review), 288.



P.

- Pachycornus discolor* Coville, 382, 383.  
*Pachystela subverticillata* E. A. Bruce, 476.  
 Pageant of the spice islands, a (review), 442.  
*Palaquium Richardsii* K. Griffioen et H. J. Lam, 17.  
 — *rivulare* H. J. Lam, 18.  
 Palm wax, 506.  
 Paltridge T. B. and Osborn, T. G. B.  
 On the climate and vegetation of the Koonamore Vegetation Reserve to 1931 (review), 288.  
*Panicum albobellereum* K. Schum., 299.  
 — *dictyonium* Fig. et De Not., 297.  
 — *humidicolum* Rendle, 297.  
 — *interruptum* Willd., 295.  
*Pavetta* sect. *Gerontopus* Brem., 484.  
 — *Bruceana* Brem., 481.  
 — *constipulata* Brem., 382.  
 — *filistipulata* Brem., 483.  
 — *sparsipila* Brem., 484.  
 Pears, apples and (review), 242.  
*Pedilanthus pavonis* Boiss., 514.  
*Pentaschistis imatongensis* C. E. Hubbard, 501.  
 — *meruensis* C. E. Hubbard, 501.  
 — *Mannii* Stapf ex C. E. Hubbard, 501.  
 — *ruwenzoriensis* C. E. Hubbard, 500.  
*Peperomia dindigulensis* Miq., 275.  
*Phaenanthoecium* C. E. Hubbard, 329.  
 — *Kostlinii* C. E. Hubbard, 330.  
 Pharmacopoeia of Martindale and Westcott, the extra (review), 241.  
*Phaseolus macrorrhynchus* Harms, 473.  
 — *Schimperi* Taub., 473.  
 Phillips, L. (obit.), 392.  
*Photinia Wardii* C. E. C. Fischer, 281.  
*Piscidia grandifolia* var. *glabrescens* Sandwith, 3.  
*Planchonella obovata* H. J. Lam, 19.  
*Plectronia cymigera* Valetton, 463.  
*Pogonia Fineti* A. Chev., 222.  
 Poison, Mundulea fish, 245.  
 Pollen grains (review), 339.  
*Polyspora* Sweet, 499.  
*Polystachya galeata* Reichb. fil., 223.  
*Potentilla argentea* var. *multifida* Tratt., 99.  
 — var. *tenuiloba* Jord., 99.  
*Pothos Brassii* B. L. Burtt, 495.  
*Prioria Copaisera* Griseb., 461.

- Pseuderanthemum* Radlk., 255.  
 — *campylosiphon* Mildbr., 260.  
 — *decurrens* Radlk., 269, 272.  
 — *dispermum* Milne-Redhead, 267.  
 — *Hildebrandtii* Lindau, 260.  
 — *hypocrateriforme* Radlk., 272.  
 — var. *breviflorum* S. Moore, 274.  
 — *kewense* L. H. Bailey, 274.  
 — *Lindavianum* De Wild. et Th. Dur., 261, 262.  
 — *Ludovicianum* Lindau, 263.  
 — *nigritianum* Radlk., 265, 267.  
 — *senense* Radlk., 269.  
 — *seticalyx* Stapf, 270.  
 — *subviscosum* Stapf, 263.  
 — *tunicatum* Milne-Redhead, 264.  
*Pseudostachyum compactiflorum* Kurz, 251, 252, 253.  
*Pseudostreptogyne* A. Camus, 330.  
 Pyrénées Orientales, the flora of the. New varieties and additions, 95.

Q.

- Quebec, flora of southern (review), 133.  
*Quercus arbutifolia* Hick. et A. Cam., 19.  
*Quisqualis malabarica* Bedd., 274.

R.

- Raffia wax, 521.  
*Rangaeris* Summerhayes, 227.  
 — *brachyceras* Summerhayes, 228.  
 — *biglandulosa* Summerhayes, 228.  
 — *Dorotheae* Summerhayes, 228.  
 — *muscicola* Summerhayes, 227, 228.  
 — *longicaudata* Summerhayes, 228.  
 — *rhypsalisocia* Summerhayes, 228.  
 — *trilobata* Summerhayes, 229.  
*Rapanea subpedicellata* Fletcher, 44.  
*Raphia pedunculata* Beauv., 521.  
*Raphionacme Vignei* E. A. Bruce, 477.  
 Raspberries and kindred fruits (review), 291.  
 Regeneration of vegetation in arid South Australia (review), 288.  
 Reid, E. M. and Chandler, M. E. J.  
 The London clay flora (review), 136.  
*Rhinacanthus communis* Nees, 261.  
*Rhipidoglossum laxiflorum* Summerhayes, 225.  
 — *longicalcar* Summerhayes, 226.  
*Rhus filicina* Sessé et Moc. ex DC., 355.  
 — *succedanea* Linn., 522.  
 — *Veatchiana* Kellogg, 383.  
*Rhynchelytrum drakensbergense* C. E. Hubbard et Schweickerdt, 323.

*Rhynchostylis latifolia* C. E. C. Fischer, 275.  
 Ridley, H. N., 107.  
 Roberts, E. A. and Lawrence, J. R. American ferns (review), 292.  
*Robinia sennoides* Roxb., 245.  
 — *suberosa* Roxb., 245.  
 Rock garden plants (review), 189.  
 Rodway, L. (obit.), 287, 502.  
 Ruellius' Dioscorides, technical terms in, 145.  
*Ruspolia* Lindau, 255.  
 — *decurrens* Milne-Redhead, 269.  
 — *hypocrateriformis* Milne-Redhead, 270.  
 — — var. *australis*, Milne-Redhead, 272.  
 — *pseuderanthemoides* Lindau, 273.  
 — *seticalyx* Milne-Redhead, 270.

S.

*Saccharum officinarum* Linn., 523.  
*Saccolipsis africana* C. E. Hubbard et Snowden, 294.  
 — *interrupta* Stapf, 295.  
 — *Johnstonii* C. E. Hubbard et Snowden, 314.  
 Salisbury, E. J. The living garden (review), 137.  
*Salix octandra* Sieb. ex A. Rich., 474.  
 — *Safsaf* Forsk. ex Trautv., 474.  
 — *safsaf baellidi* Forsk., 474.  
 — *suberrata* Willd., 474.  
*Salvia hierosolymitana* Boiss., 16.  
 Sampson, H. C. Cultivated crop plants of the British Empire and of the Anglo-Egyptian Sudan (review), 240.  
 Sandwith, N. Y. Contributions to the flora of tropical America: xxvi. The genus *Tovomita* in British Guiana, 210.  
 Scent-yielding woods known as "Medang," the anatomy of some lauraceous, 66.  
 Schima, notes on the genus, 496.  
*Schima argentea* Pritz., 497.  
 — *antherisosa* Korth., 496.  
 — *bambusifolia* Hu, 498.  
 — *bancana* Miq., 498.  
 — *Beccarii* Warb., 498.  
 — *boninensis* Melch., 498.  
 — *boninensis* Nakai, 498.  
 — *brevifolia* Baill. ex Stapf, 498.  
 — *brevipes* Craib, 498.  
 — *confertiflora* Merr., 497.  
 — *crenata* Korth., 496, 497.  
 — *Forrestii* Airy-Shaw, 496.  
 — *hastiana* Dyer, 496.

*Schima liukiuensis* Nak., 497.  
 — *Lobbii* Pierre, 498.  
 — *Mairei* Hochr., 497.  
 — *Mertensiana* Koidz., 498.  
 — *mollis* Dyer, 498.  
 — *Noronhae* Reinw., 497.  
 — *sericea* Airy-Shaw, 498.  
 — *sinensis* Airy-Shaw, 497.  
 — *stellata* Pierre, 498.  
 — *superba* Gardn. et Champ., 497.  
 — *Wallichii* Choisy, 498.

Schröter, C., 107.  
 Schweickerdt, H. G. Notes on African grasses, 293.  
 Scientific principles of plant protection, the (review), 444.  
*Senecio adonidifolius* var. *platylobus* R. et F., 99.  
 — *Holubii* Hutch. et Burtt Davy, 81.  
 — *Junodii* Hutch. et Burtt Davy, 81.  
 — *lydenburgensis* Hutch. et Burtt Davy, 82.  
 — *Mooreanus* Hutch. et Burtt Davy, 82.  
 — *scitulus* Hutch. et Burtt Davy, 82.  
 — *Serra* var. *macrocephalus* Hutch. et Burtt Davy, 83.  
 Seward, A. C., 335, 336.  
 Shaw, F. J. F., 335, (obit.) 393.  
 Siam, contributions to the flora of, 34.  
 Sierra Leone, list of fungi collected in, 424.  
 — preliminary list of fungi and diseases of plants in, 397.  
*Silene maritima* and *S. vulgaris*, researches on, 445.  
 — *vulgaris*, researches on *S. maritima* and, 445.  
*Silene dichotoma* Ehrh., 102.  
 — — var. *glabra* Turrill, 102.  
 — *divaricata* S. et S., 102.  
 — *graeca* Boiss. et Sprun., 102.  
 — *racemosa* Otth., 102.  
 — *Sibthorpiana* Reichb., 102.  
 Silva Tarouca, Count (obit.), 501.  
 Snowden, J. D. Notes on African grasses, 293.  
 Soil science, bibliography of (review), 141.  
*Sorghum castaneum* C. E. Hubbard et Snowden, 316.  
 South African plants, new or noteworthy, 80.  
 — Australia, fungi of (review), 141.  
 — — regeneration of vegetation in arid (review), 288.

Southern Nigeria, forest flora of (review), 466.  
 Soya bean, all about the (review), 340.  
 Spartina Townsendii and S. brasiliensis in warm countries, 21.  
 Spice islands, a pageant of the (review), 442.  
*Spiraeopsis celebica* Miq., 462.  
 — *philippinensis* Elmer, 462.  
*Sporobolus alpicola* Hochst. ex A. Rich., 310.  
 Sprague, T. A. Note on typification, 441.  
 — Principal decisions concerning nomenclature made by the sixth international botanical congress, 185.  
 — Technical terms in Ruellius' Dioscorides, 145.  
*Stipa tenacissima* Linn., 524.  
 Stokes, S. G. The genus *Eriogonum* (review), 443.  
*Streblochaete* Hochst. ex Pilger, 330.  
 — *Köstlinii* Hochst., 330.  
 — *longiaristum* Pilger, 330.  
 — *nutans* Hochst., 330.  
 — *Schimperii* Hochst. ex Steud., 330.  
*Streptocarpus pumilus* B. L. Burtt, 491.  
 — *umtaliensis* B. L. Burtt, 492.  
*Strobilanthes Wightianus* Nees, 274.  
*Styrax Hintoni* Bullock, 9.  
 — *jaliscana* S. Watson, 9.  
 — *officinalis* var. *jaliscana* Perkins, 9.  
 Summerhayes, V. S. African orchids, 221.  
 Swanton, E. W., 336.

T.

*Taccaea tomentosa* E. A. Bruce, 477.  
*Taconabo Pringlei* Rose, 390.  
 Tanganyika Territory, second list of fungi and diseases of economic plants in, 234.  
*Tapinostemma meridianum* Danser, 475.  
*Taraktogenos Kursii* King, 341.  
*Tarchonanthus Galpinii* Hutch. et Phillips, 85.  
*Tarenna quadrangularis* Brem., 484.  
 Tempny, H. A., 240.  
*Tephrosia ichthyneca* Bertol., 245.  
 — *Petersiana* Klotzsch, 245.  
 — *sericea* DC., 245.  
 — *suberosa* DC., 245.  
*Terebinthus acuminata* Rose, 373.

*Terebinthus Aloexylon* W. F. Wight ex Rose, 363.  
 — *aptera* Rose, 361.  
 — *arborea* Rose, 353.  
 — *arida* Rose, 353.  
 — *attenuata* Rose, 382.  
 — *bicolor* Rose, 354.  
 — *biflora* Rose, 354.  
 — *bipinnata* W. F. Wight ex Rose, 355.  
 — *cerasifolia* Rose, 356.  
 — *cinerea* Rose, 364.  
 — *cuneata* Rose, 368.  
 — *diversifolia* Rose, 359.  
 — *excelsa* W. F. Wight ex Rose, 360.  
 — *fagaroides* Rose, 361.  
 — *fragilis* Rose, 369.  
 — *Galeottiana* Rose, 363.  
 — *glabrescens* Rose, 368.  
 — *gracilis* Rose, 355.  
 — *grandifolia* Rose, 364.  
 — *heterophylla* Rose, 365.  
 — *Jonesii* Rose, 375.  
 — *jurullensis* W. F. Wight ex Rose, 368.  
 — *Karwinskii* Rose, 369.  
 — *Kerberi* Rose, 377.  
 — *lanceifolia* W. F. Wight ex Rose, 369.  
 — *lanuginosa* Rose, 368.  
 — *laxiflora* Rose, 370.  
 — *longipes* Rose, 371.  
 — *MacDougalii* Rose, 366.  
 — *mexicana* W. F. Wight ex Rose, 374.  
 — *microphylla* Rose, 371.  
 — *morelensis* Rose, 371.  
 — *multifolia* Rose, 371.  
 — *multijuga* Rose, 372.  
 — *Nelsoni* Rose, 364.  
 — *odorata* Rose, 362.  
 — *ovalifolia* Rose, 373.  
 — *Palmeri* Rose, 360.  
 — *pannosa* Rose, 375.  
 — *penicillata* Rose, 374.  
 — *pilosa* Rose, 382.  
 — *Pringlei* Rose, 372.  
 — *pubescens* Rose, 382.  
 — *rhoifolia* Rose, 366.  
 — *rubra* Rose, 375.  
 — *Schaffneri* Rose, 361.  
 — *Schiedeana* Rose, 364.  
 — *Schlechtendalii* Rose, 375.  
 — *sessiliflora* Rose, 375.  
 — *submoniliformis* Rose, 377.  
 — *tenuifolia* Rose, 356.  
 — *trijuga* Rose, 370.





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